MACHINERY

Design—Construction—Operation

Volume 46 **FEBRUARY, 1940** **Number 6**

March MACHINERY will cover, in addition to the usual articles on Ingenious Mechanisms, Design of Tools and Fixtures, Materials of Industry, and Shop Equipment News, a number of special articles among which may be mentioned Gear Materials and Their Heat-Treatment; Cutting Oils and Their Application; the Drawing and Forming of Deep Tapered Shells; and Reducing the Cost of Polishing. There will also be an article dealing with work performed in the manufacture of big guns and gun mounts at the Watertown Arsenal.

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DEPARTMENTS

PUBLISHED MONTHLY BY
THE INDUSTRIAL PRESS
148 Lafayette Street New York

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LONDON: MACHINERY, 83-113 Euston Road

PARIS: La Machine Moderne, 15 Rue Bleue

YEARLY SUBSCRIPTION: United States and Canada, $3 (two years, $5): foreign countries, $6. Single copies, 35 cents.

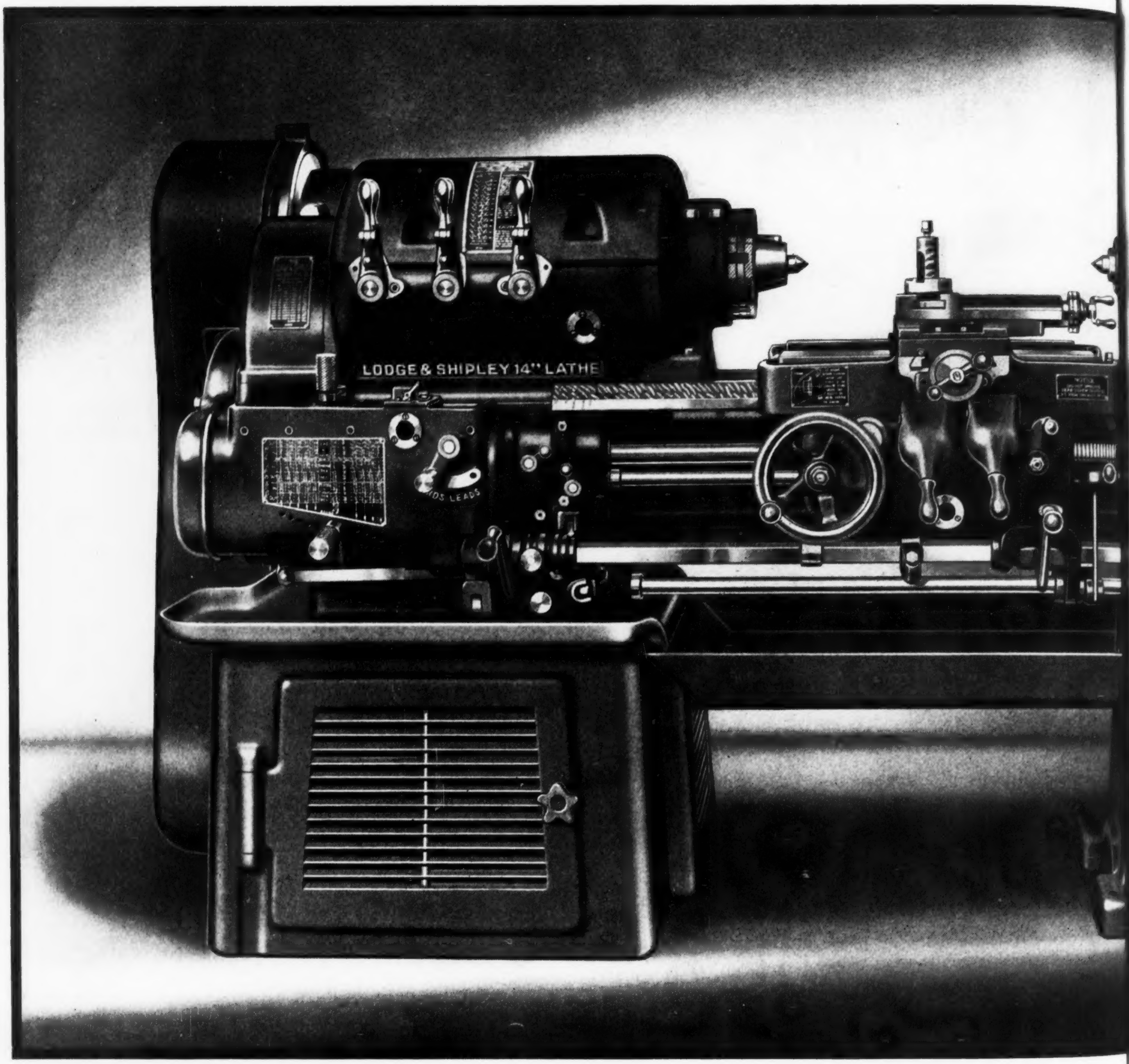
Changes in address must be received by the fifteenth of the month to be effective for the forthcoming issue.

Send old as well as new address.

Entered as second-class mail matter, September, 1894, at the Post Office, New York, N. Y., under the Act of March 3, 1879. Printed in the United States of America

Member of A.B.P. Member of A.B.C.

TOTAL DISTRIBUTION, 17,725



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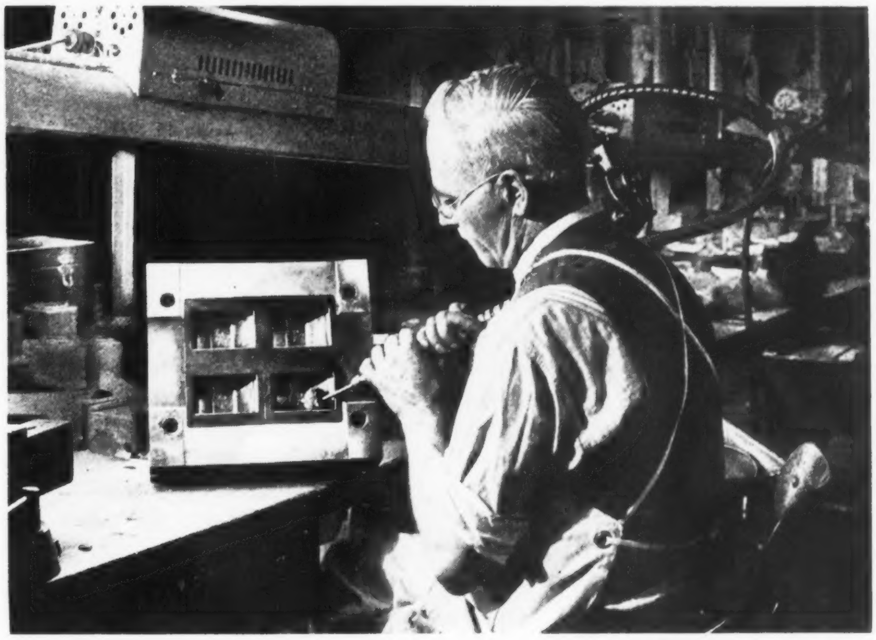
MACHINERY

Volume 46 NEW YORK, FEBRUARY, 1940 Number 6

Hobbing Molds in the General Electric Plastics Department



Buffing the Completed Mold

How the Hobbing of Molds is Performed
Types of Steel Used for Hobs and Molds
How These Steels are Heat-Treated

By CHARLES O. HERB

HOBBING and hubbing are synonymous terms for a process that has come to be widely adopted in the making of molds for synthetic plastic materials. This process involves the use of a hob or hub of hardened tool steel having a shape at its forming end that corresponds with the part to be produced in the mold. The hob is applied in a powerful hydraulic press to form the desired impression or cavity in the unheated blank of steel from which the mold is to be made.

Mold cavities can be produced more readily by this practice than by die-sinking, and many shapes that would be practically impossible to machine in a molded blank can be obtained with less difficulty by the hobbing method. Hobs leave smooth surfaces in mold cavities that preclude the necessity of filing or similar finishing operations.

Another outstanding advantage of this process is that cavities of exactly the same size and shape can be produced in different molds. Thus, interchangeability of plastic parts produced in different molds at various times is insured. This article will outline the hobbing practice followed in making molds in the tool-room of the Plastics Department of the General Electric Co., Pittsfield, Mass.

The Procedure in Hobbing a Mold for Synthetic Plastic Materials

Hobbing operations are performed in a 1000-ton hydraulic press with the annealed blank of steel for the mold usually confined within a large circular fixture or "bull ring," as shown in Fig. 1. After the hob has been properly located on the mold blank, the press ram is gradually brought down into contact with the top of the hob. Then pressure is applied to force the hob the required distance into the blank. Various pressures are used as required. The hob is not fastened to the press ram.

The amount that the hob is forced into the mold blank with one annealing of the blank varies from 1/4 inch to 1 1/2 inches, depending on the shape and strength of the hob. Hobs with rounded corners and edges can be forced deeper in one step than hobs with square edges. Care must always be taken not to draw the mold metal beyond the fracture point, as the steel would then become laminated and the surfaces of the cavity would soon disintegrate. The attempt is always made to maintain a fiber-line flow in the metal being displaced. A dial indicator is generally placed between the top of the mold blank and the press ram to determine the amount of hob movement in each step.

In the case of the hob shown in Fig. 1, which has a maximum cross-section of 5 1/4 inches by 2 3/16 inches, six hobbing operations are required to force it 3 3/8 inches into a mold blank. In Fig. 2 is illustrated a mold with two blocks having cavities produced with this hob, the hob being seen in front of the mold.

When more than one operation is required to force a hob to the full depth of the desired cavity, each hobbing step must be followed by an annealing operation. In the annealed condition, the hardness of the blanks is required to be between 115 and 120 Brinell.

A second ring of steel is often placed within the "bull ring" after the hob is at the correct depth, and pressure applied to force the metal against the hob, so as to correct the tendency for the hobbed cavity to become bell-mouthed. Also, the under side of the mold blank is frequently drilled or bored to a diameter smaller than the cavity so as to provide a place for the displaced metal to flow into. This practice, of course, makes the hobbing operation much easier than if the displaced metal were merely compressed into the blank itself. Often the solid blank is seated on the press table for the first two or three hobbing steps, and then the mold is placed on a ring so that the displaced metal can flow into the ring opening during the succeeding steps of the operation.

Premachined Molds are Necessary for Intricate Designs

When the cavity in a mold is to have a number of square corners, a large amount of intricate detail, or bosses at the bottom, it is practically impossible to obtain a satisfactory job by simply hobbing a plain blank of steel. In such cases, the details required at the bottom of the mold cavity are milled on the top surface of the mold by employing a duplicator machine. Then a hob with these details also machined on it is carefully seated on the premachined surface of the mold and applied for pressing this surface the required distance into the mold. This hobbing operation must be repeated a number of times, depending on the required depth of the cavity, as in the case of simpler hobs, and an anneal must follow each hobbing step.

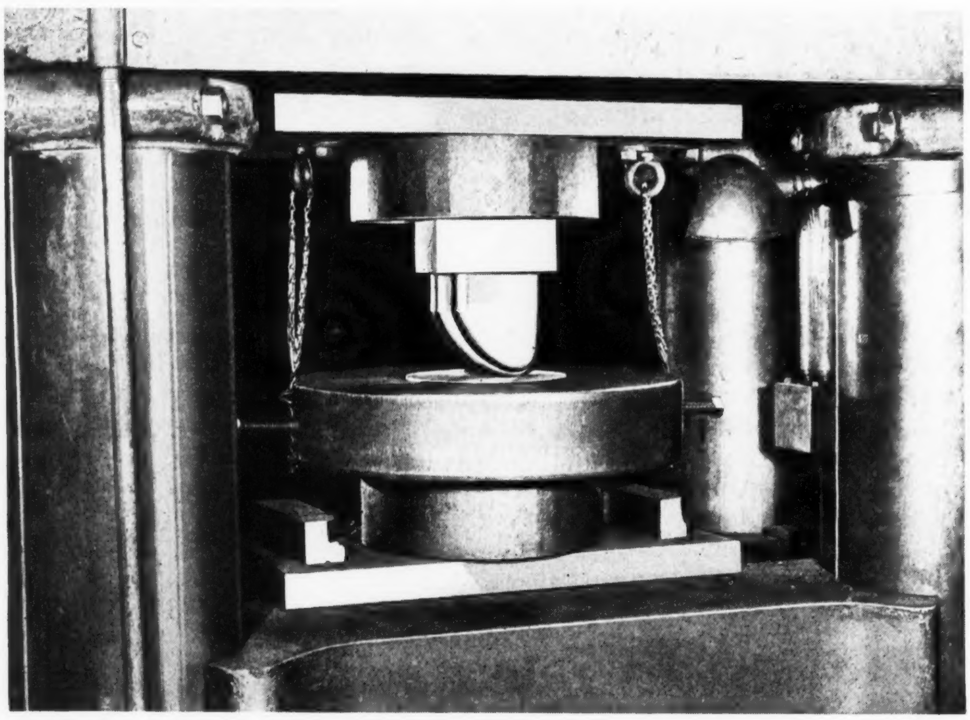
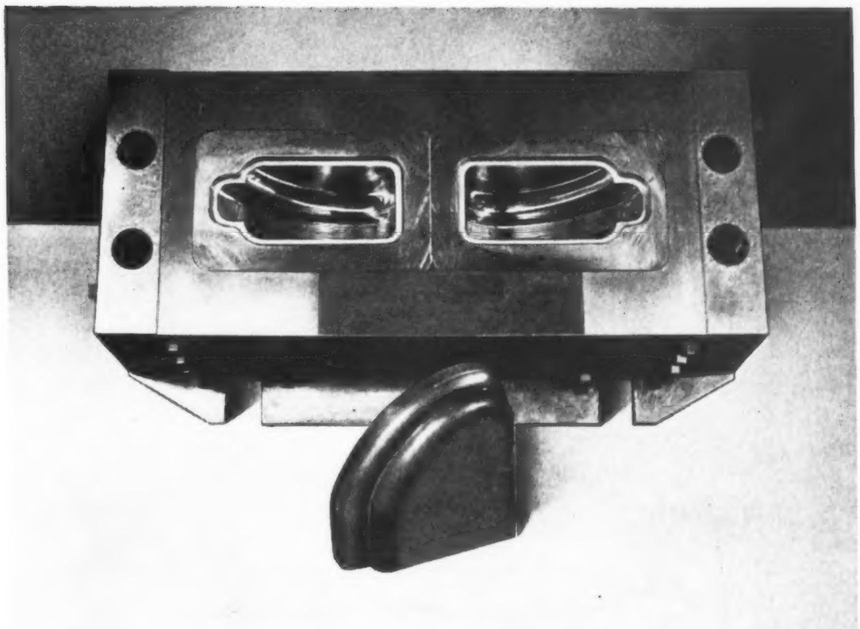


Fig. 1. Molds for Plastic Materials are Formed by Forcing a Hob into a Steel Blank Under Heavy Pressure

Fig. 2. Typical Mold for Synthetic Plastic Materials with Two Cavities Formed by the Hob Seen in the Foreground



A hob for an operation in which the mold surface must be premachined because of the large amount of lettering and the small numbers required is seen in the middle of Fig. 3. This hob is 9 inches long by 4 inches wide. Hobbing premachined molds saves considerable time and labor, as compared with die-sinking, because the intricate surface is at the top of the mold blank instead of at the bottom of a cavity that may be an inch or two deep. Also, as in the case of simpler cavities, exact duplication of molds is insured by the hobbing of premachined impressions. Approximately 40 per cent of the molds made in this plant are premachined.

Areas as large as 20 square inches have been hobbed in the tool-room of this plant. The depth of hobbing depends entirely upon the limitations of the press. With the press shown in Fig. 1, cavities can be sunk to a depth of approximately 10 inches.

Steels Used for Hobs and Molds and Their Heat-Treatment

The hobs employed for mold-forming operations are made from various grades of tool steel, ranging from the straight-carbon water-hardened type up to and including high-chromium alloys. The choice of the hob steel is entirely dependent on the cross-section of the part to be produced in the mold and on the intricacy of the mold detail.

One of the steels used for hobs has the following analysis: Carbon, 0.40 to 0.45 per cent; chromium, 1.40 to 1.50 per cent; manganese, 0.30 per cent; silicon, 1.40 to 1.50 per cent; and vanadium, 0.20 to 0.30 per cent. When hardened, it develops unusual toughness and a high degree of resistance to shock.

After being machined to the required shape, hobs are packed in old carburizing compound and loaded into a furnace that is brought to a temperature of between 1650 and 1700 degrees F. This temperature is maintained from one to two hours to allow the heat to soak completely through the hobs, after which they are quenched in oil. They are then tempered at from 375 to 400 degrees F. to obtain a hardness of between 62 and 63 Rockwell C.

The hobs are machined prior to heat-treatment on milling machines of the type seen in Fig. 4 from a wooden or metal model that is located on the slide at the right. As the tracing stylus is fed by hand over the surfaces of this model, a milling cutter in the left-hand spindle is automatically guided over similar paths on the piece of steel clamped on the left-hand slide, which is being formed into a hob.

In the left background of Fig. 3 is shown a hob for producing mold cavities for plastic clock cases without a premachining operation. In the left foreground is a hob for the mold cavity for a percolator handle which requires a premachined mold blank. In the right background is a hob for the mold for an electric iron handle, and in the right foreground, a hob for the mold for a merchandising display stand. The clock mold hob is sunk into the steel blank a distance of 2 inches, while the "Autobridge" hob in the center is pressed into the blank just enough to obtain a satisfactory impression.

Fig. 5 shows several smaller hobs for the molds for a plastic bevel gear, electrical receptacles, and other parts of comparatively small dimensions. Hobs are made with a draft, whenever possible, to facilitate withdrawing them from the cavity. A draft of about 0.005 inch per inch of length has been found satisfactory. Hobs are generally made about 0.003 inch under size.

The most important properties in the steels used for molds include cleanness; resistance to upsetting; wear resistance; and ease of hobbing, machining, and heat-treatment. The steel should be free from internal defects, such as pin-holes, hair-

Fig. 3. Five Hobs of Different Types, Some of which are Applied to Premachined Mold Surfaces and Others to Plain Surfaces

line cracks, sponginess, and slag or other foreign materials that might appear on the surfaces of the cavity and spoil the finish of the product. Another objection to such defects is that they tend to open up when pressure is applied in hobbing. Defects of this nature often are not noticed until after the mold cavity has been polished and the mold placed in service.

Upon the strength of the mold steel depends the amount of pressure that the cavity will withstand without upsetting, bell-mouthing, or breaking. Strength is, therefore, especially important in the case of molds having thin sections or large surface areas. In order to provide the desired resistance to wear, the mold steels generally contain nickel and chromium.

Steel for molds should possess reasonably good hobbing qualities, and at the same time, should have the required strength after the final heat-treatment. The depth to which the hob can be sunk at each step depends, of course, upon the hardness of the steel when annealed. Obviously, then, the harder and stronger the steel, the more difficult the hobbing operation. It is important to select a mold steel that will provide the greatest strength commensurate with economical hobbing costs. When premachining is necessary, the mold steel should machine fairly easily, but cleanness of the finished surface should never be sacrificed for machinability.

Since the finished molds must be heat-treated to obtain strength and resistance to wear, the mold steel should also be selected with a view to obtaining minimum distortion from the heat-treatment, as otherwise, the dimensions of the mold cavity will be inaccurate. Excessive scaling in heat-

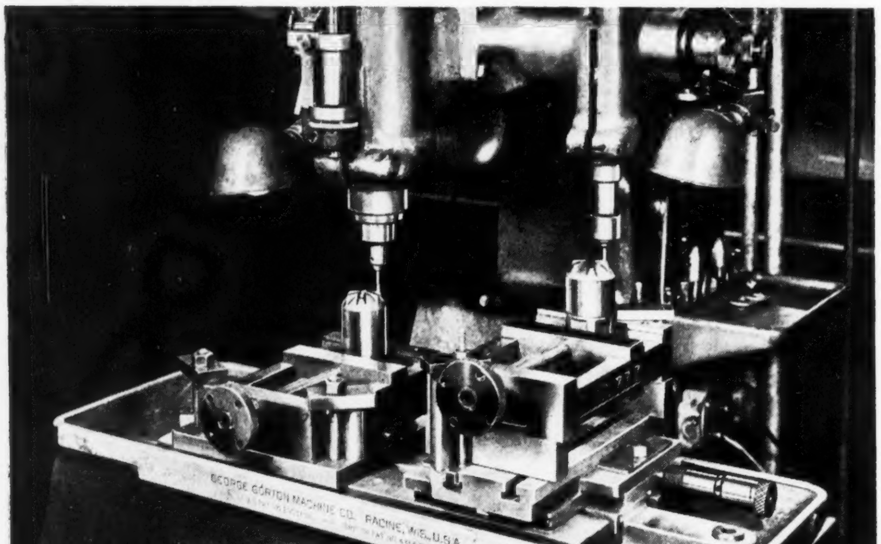


Fig. 4. The Desired Shape is Milled in the Tool-steel Hobs by the Use of Models and Tracers that Automatically Control the Movements of the Milling Cutter

Fig. 5. Hobs Used to Form the Mold Cavities for a Variety of Plastic Parts Ranging from a Bevel Gear to Electrical Receptacles

treatment must also be avoided, because polished surfaces are essential in the mold cavities; for that reason, a comparatively low hardening temperature is desirable.

The General Electric Plastics Department usually hobs molds from No. 1 Samson steel or Hawk Brand 3110. Both of these brands are electric furnace alloys having approximately the following analysis: Carbon, 0.10 per cent; manganese, 0.50 per cent; chromium, 0.50 per cent; and nickel, 1.25 per cent. This steel has an elastic limit of 80,000 pounds per square inch, which insures adequate strength after hardening. After heat-treatment, it has a hardness of approximately 63 Rockwell C. When the molds are required to withstand arduous duty, a steel of special analysis is employed containing about 1 1/2 per cent chromium and 3 1/2 per cent nickel. This is an electric furnace steel known as Crusca 12-B.

Annealing, Hardening, and Tempering the Molds

The mold blanks are annealed before hobbing and between successive hobbing steps by heating them in an electric furnace for between four and six hours at a temperature of 1250 degrees F. The mold is then allowed to cool in the furnace to below the scaling point and afterward in air. Annealing is generally performed at night, so as to prepare the mold for hobbing during the daytime.

In the annealing operations, it is necessary to protect the hobbed surface from scaling. This is done by filling the cavity with a non-scaling powder after the mold has been heated to about 400 degrees F. The mold is then returned to the furnace and heated to the annealing temperature mentioned. At the end of the annealing operation, the caked powder is removed from the cavity by either immersing the mold in boiling water or applying live steam.

When the hobbing of a mold has been completed, the mold is carburized, hardened, and tempered. Carburizing is performed by loading the mold into an atmosphere-controlled furnace heated to 1650 degrees F. and held at that temperature for six hours while city gas is fed into the furnace for injecting carbon into the mold surfaces. The furnace fuel is then shut off and the temperature allowed to drop to 1550 degrees F., at which point the mold is withdrawn from the furnace and quenched in oil. The hardened surfaces are approximately 0.040 inch deep and have a reading of about 58 Rockwell C.

Upon cooling the molds are drawn at a temperature between 300 and 400 degrees F., the period of the heating being based upon approximately one hour for each inch of mold cross-section.

Polishing and Plating the Mold Cavities

The final work on the mold cavities consists of polishing the surfaces with flexible shaft machines fitted with buffs, as shown in the heading illustration. Then the cavities are chromium-plated to obtain a highly polished, corrosion resisting, long wearing surface. The chromium is deposited directly on the steel to a depth between 0.001 and 0.002 inch. Upon the completion of the plating operation, the mold is assembled in a retainer block either separately or in multiple. Machining of the outer surfaces of the molds to fit the retainer blocks is, of course, performed prior to the carburizing, hardening, and tempering operations.

* * *

Although acetylene gas and some of its properties were discovered by Edmund Davy in 1836, it was not until early in the present century that the real value of this gas for heating, cutting, and welding became fully appreciated.

Recent Developments in

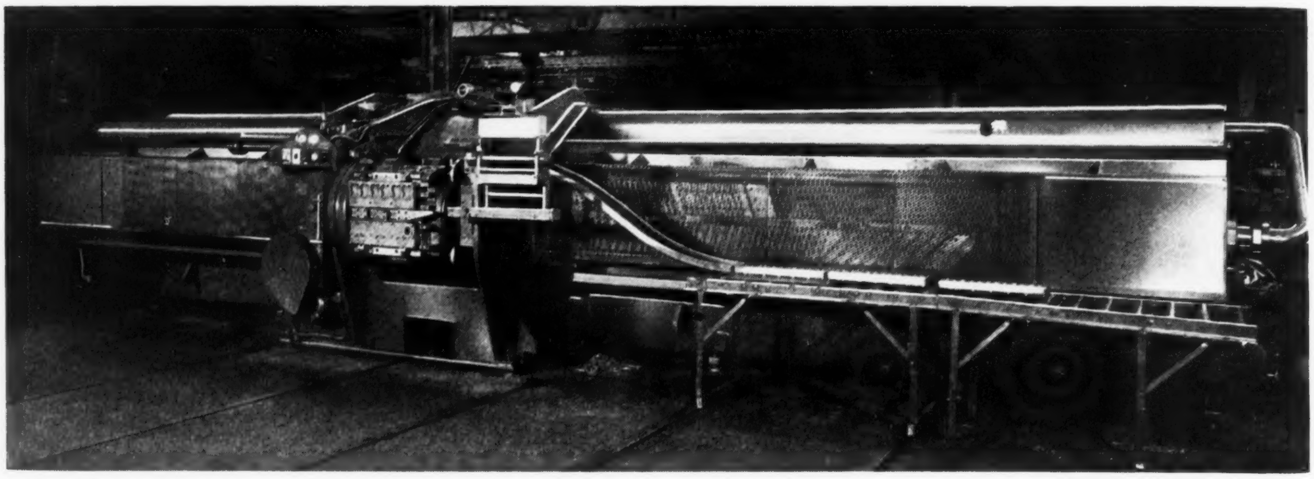


Fig. 1. Special Horizontal Broaching Machine Equipped with Drum Type Fixture for Broaching Cylinder Heads

A SPECIAL horizontal broaching machine equipped for broaching the top and bottom surfaces of cast-iron cylinder heads for automobile engines is shown in Fig. 1. This machine, equipped with a special drum fixture, as shown in the close-up view, Fig. 2, removes 3/16 inch of stock from the cylinder head, giving good commercial finish and accuracy at a production rate of seventy-seven cylinder heads per hour. The special inserted-tooth broach used for this work is operated at a ram speed of 36 feet per minute.

The drum type fixture has two work-holding units. These units are located diametrically opposite each other, and each holds two cylinder heads. As shown in Fig. 2, the cylinder head clamped in the upper position is located for broaching the bottom surface, while the cylinder head in the lower position is located for broaching the top surface. With this arrangement, one cylinder head is completely finished at each stroke of the ram.

After the two heads have been broached on one side, the fixture is indexed 90 degrees toward the operator. This brings the cylinder head in the bottom finishing position opposite the chute shown at the right of the fixture. The other cylinder head is then in front of the hinged transfer frame located in front of the chute. A hydraulic pusher now moves in from the left and ejects the cylinder heads from the fixture. The finished cylinder head slides down the chute while the cylinder head finished only on the top is pushed into the transfer frame.

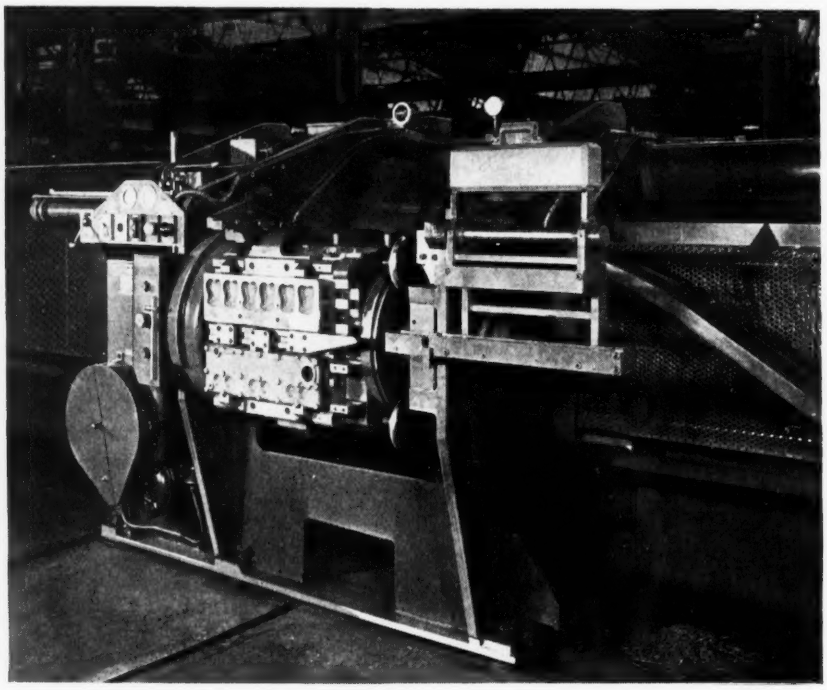


Fig. 2. Close-up View of Drum Type Fixture and Transfer Frame of Machine Shown in Fig. 1

The transfer frame is then swung through an angle of 90 degrees, the drum fixture also being indexed through the same angle. At the end of these indexing movements, the cylinder head in the transfer frame is located in the reverse position opposite the upper work-holding position of the fixture. It can then be slid easily into the upper work-holding position while a new cylinder head is placed in the lower work-holding position. While the loading is taking place, the two cylinder heads on the opposite side of the drum fixture are being broached.

The fixture is provided with automatic mechanically actuated clamps

Broaching Automotive Parts

Both the Horizontal and Vertical Broaching Machines Built by the Cincinnati Milling Machine Co. have been Equipped with Fixtures Designed to Step up the Production of Automotive Parts

and a hydraulic pusher, as stated, for moving the two heads out of the fixture. There is a separate motor that imparts the required indexing movements to the fixture. An exhaust system takes care of the removal of fine chips and dust.

In Fig. 3 is shown a vertical broaching machine equipped for machining operations on an automobile connecting-rod and cap. The operation consists of broaching the half-bores and the joint faces with their keys and keyways. The connecting-rods are steel forgings having a Brinell hardness of 200. From 0.205 to 0.215 inch of stock is removed in this operation, which is required to hold the machined surfaces of the half-bores within plus or minus limits of 0.002 inch, and the joint faces within 0.001 inch with respect to flatness. The hourly output on this job is 120 pieces—that is, 60 rods and 60 caps.

One of the advantages of this method of machining is that the joint faces, with their keys and keyways, can be broached with the half-bore in a single machine set-up. The fixtures are universal in that they will hold either the rod or the cap.

The rods are located in the fixtures from the piston-pin hole, the locating pads on the milled bolt lugs, and a finished crank face. Clamping jaws on top of the work serve to hold the rods securely in place. The caps are located in the same fixtures from the two locating pads on the milled bolt lugs and the finished bolt seats opposite the joint faces, with the same clamp at the top.

The broaching machine shown in Fig. 4 is equipped for machining automobile transmission shifter fork levers like the one shown resting on the fixture at the right. A lever is also shown clamped in this fixture in the proper position for one of the two broaching operations performed by this duplex machine. Both fixtures employed on this machine are of the hand-clamping type.

The tool equipment is arranged to complete a shifter lever at each operating cycle, the fixtures being mounted on a 45-degree indexing table. The fixture at the left, which is in the broaching position, holds the piece with the fork in a vertical position for form-broaching the radius-shaped section at the rear of the fork. A flat surface is also broached on the left side of each of the front bosses for locating purposes in the next operation.

The second operation, which is performed with the fixture at the right indexed into the broaching

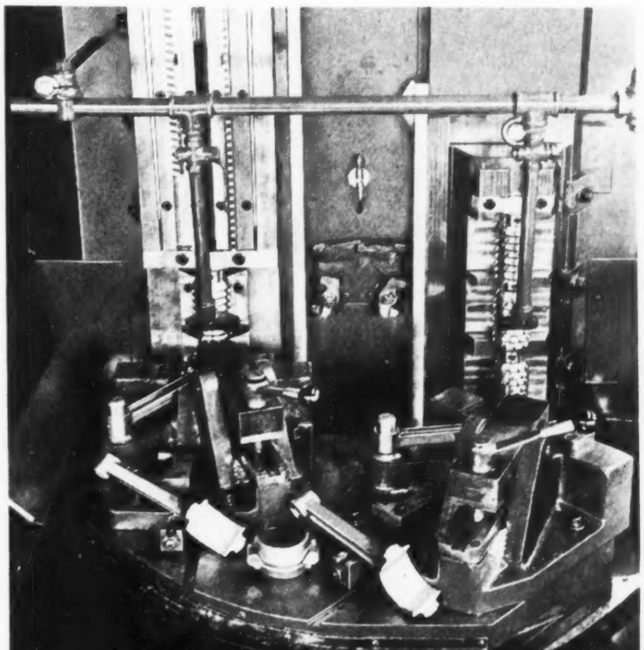


Fig. 3. Vertical Duplex Broaching Machine Equipped for Operations on Connecting-rods and Caps

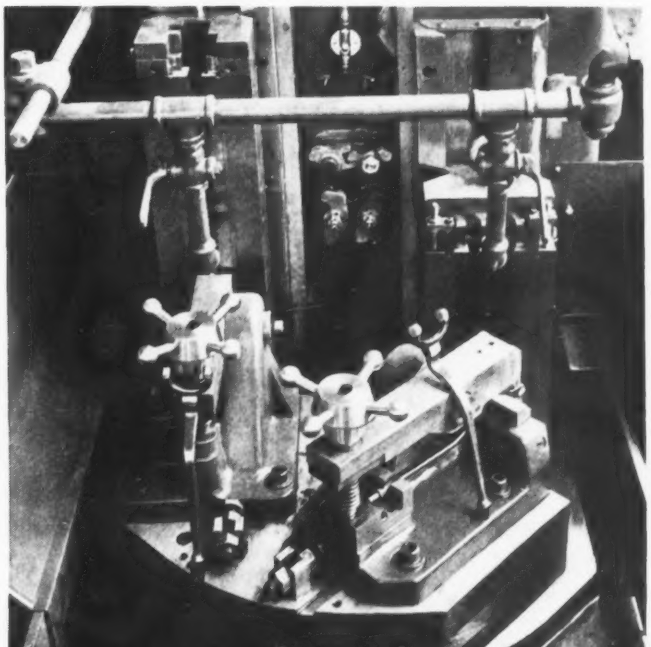


Fig. 4. Equipment for Broaching Transmission Shifter Fork Levers on Duplex Broaching Machine

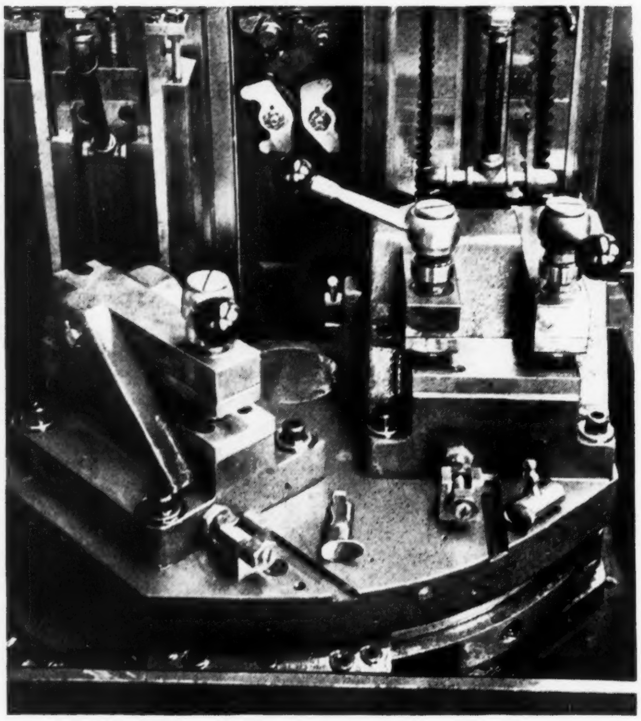


Fig. 5. Broaching Machine Equipped with Variable-speed Control and Special Fixtures for Holding Transmission Shifter Levers

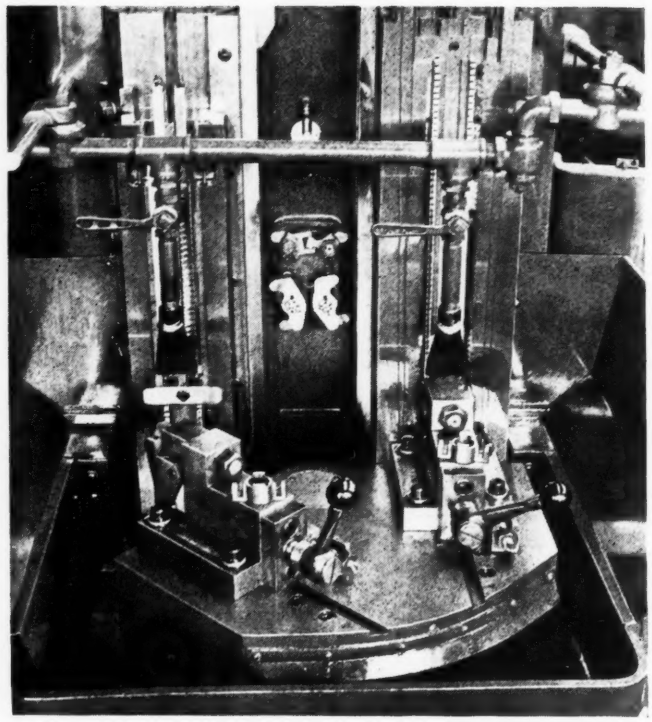


Fig. 6. Two-fixture Set-up for Broaching Ends, Slots, and Two Sides of the Tongues of Automobile Transmission Collars

position, consists of broaching the four faces of the fork. In this operation, the work is clamped in the fixture, using the previously broached surfaces for locating purposes. This arrangement provides three supporting points of contact under the fork. thus assuring squareness with the previously finished radius-formed section.

Automobile transmission shifter levers of the design shown on the broaching fixture table in Fig. 5 are broached on the ends, sides, and formed portions at an hourly rate of 136 and 126 pieces for two different types. These shifter levers are steel forgings and require a good commercial finish to within 0.002 inch of the designated dimensions. A maximum of 0.181 inch of stock is removed. The broaches used are of the solid high-speed steel type. The ram speed employed is 38 feet per minute, the forward and return speeds being the same.

The first operation on the shifter lever is performed by the ram at the left, and consists of broaching the ends of the barrel of the lever. The next operation—drilling and spline-broaching a hole in the work—is done with other equipment. The work then comes back to the broaching machine. It is next clamped in the left-hand station of the right-hand fixture for broaching the sides of the wing member. The last operation, performed with the work held in the station on the right-hand side of the fixture, consists of broaching the double form on the wing section.

The left-hand fixture employed on this machine is of the hand-clamping type, a screw with an Acme thread acting as the clamping medium through a rapid retracting overhead clamp. At this station, the work, which is the original forging, is located from three fixed points, two under the barrel and the third under the wing member. Sidewise location is obtained from the side of the wing.

For the next operation, performed in the right-hand fixture, the work is located over a stud, side positioning being accomplished from the finished end of the barrel. An adjustable support contacts the work under the wing.

The ends, slots, and two sides of the tongues of automobile transmission collars, like those seen resting on top of the two fixtures in Fig. 6, are broached at an hourly output of 216 pieces, or 14 1/2 seconds per piece by means of the fixtures and broach equipment shown in this illustration. These collars are made of malleable iron. About 3/32 inch of material is removed by the broaches, a ram speed of 38 feet per minute being used both on the forward and return strokes. The table is arranged for alternately indexing the two fixtures into the broaching position.

The fixture at the left is shown in the loading position. This fixture is used in broaching the top surface and rough-broaching a slot. The fixture at the right, which is shown in the broaching position, is employed for holding the work while broaching the tongues, two slots, and both ends. In both fixtures, the piece is centered on a stud and located from its back face.

After the broaching is performed in the fixture at the left, the work is transferred to the right-hand fixture for finish-broaching. The clamp, located under the piece, is actuated by a hand-lever mounted on a screw having an Acme thread.

Making the Army's Big Guns at Watervliet

By COLONEL RICHARD H. SOMERS
Commanding Officer, Watervliet, N. Y.

OPERATIONS in machining the tubes and liners for 3-inch anti-aircraft guns were described in an article in July, 1939, MACHINERY, page 744. The present article will deal with the machining of breech mechanism parts and with checking equipment of the gage control department.

A great deal of accurate work is necessary in machining the breech rings for the 3-inch anti-aircraft guns. Fig. 1 illustrates one of the preliminary operations, which consists of turning, boring, and facing a breech ring on a Bullard vertical turret lathe. In this operation, the end seen resting on the machine table is first turned and bored, after which the side seen uppermost is faced, and the inside rough- and semi-finish-bored in the manner shown. All dimensions must be held within a tolerance of 0.002 or 0.003 inch. The forging is extremely tough, containing a considerable quantity of nickel.

One of the subsequent operations on the breech ring consists of slotting the breech recess on a Pratt & Whitney vertical shaper, as illustrated in Fig. 2. Slotting is performed around the entire recess, which consists of a multiple number of surfaces. On some breech rings the recess walls are tapered, in which case the work fixture is of a design that can be tilted to suit. The customary tolerance in these operations is also 0.002 inch.

The breech rings are finish-bored on a Giddings & Lewis horizontal boring, drilling, and milling machine, as shown in Fig. 3, use being made of a special tool-head equipped with a dial indicator to facilitate accurate radial settings of the tool bit. When the boring has been completed, an internal thread of modified Acme form, 0.20 inch deep and of 0.75 inch pitch, is cut in this machine to mate a similar thread chased on the breech end of the gun tube. In cutting this thread, a form cutter is used for roughing the entire thread contour, after which separate tools are used for finishing the bottom of the thread, the pressure wall, and the clearance wall.

Extremely close tolerances are specified on all cuts taken by this machine. For that reason, in addition to the dial indicator on the tool-head, there is one on the machine head that shows up any vibration during the boring or the rough-threading

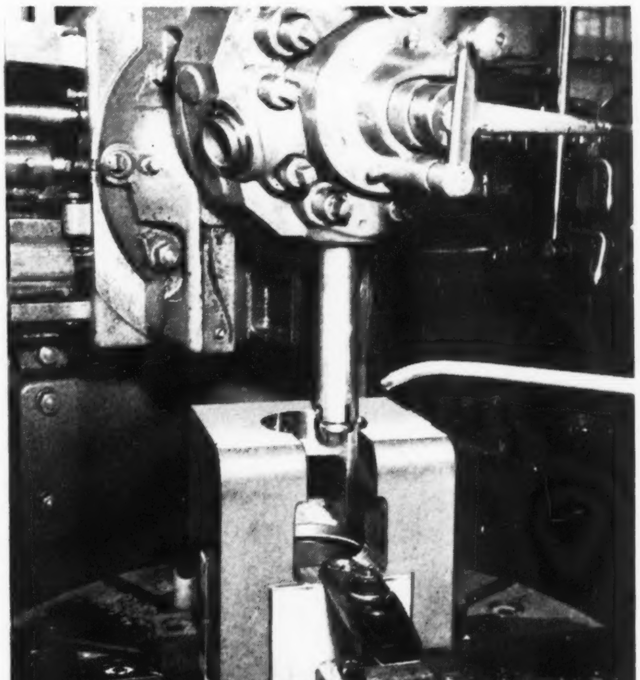


Fig. 1. Rough- and Semi-finish-boring, Turning, and Facing a Breech Ring on a Vertical Turret Lathe

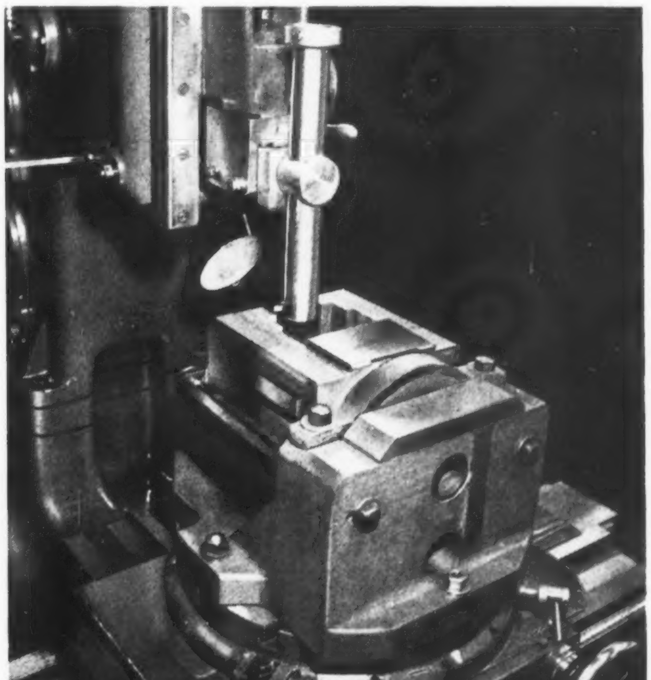


Fig. 2. Machining the Multiple Number of Recess Surfaces in a Breech Ring on a Vertical Shaper

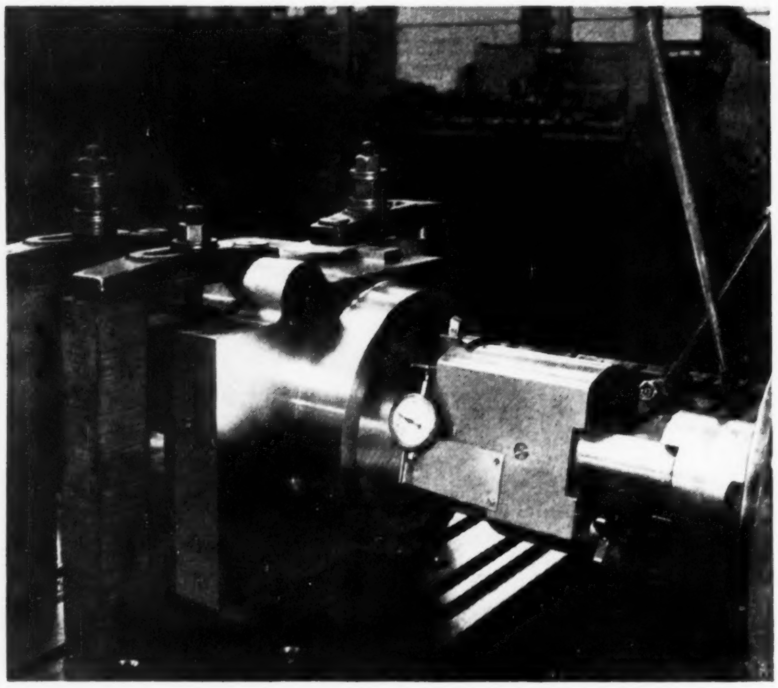


Fig. 3. Finish-boring the Breech Ring on a Horizontal Boring, Drilling, and Milling Machine Preliminary to Threading the Ring Internally on the Same Machine

cut. A third dial indicator on the carriage registers against the front of the table to detect any vibration during the same cuts, and there is a fourth indicator on the bed which contacts a hardened block on the side of the carriage to determine how much stock is being chased off during the finishing of the pressure wall of the thread. Cuts as light as 0.00025 inch are taken on this surface.

Kellermatics are employed for the contour-milling of a variety of parts. In the operation illustrated in Fig. 4, extractors for 3-inch anti-aircraft guns are being milled three at a time, the machine being equipped with three cutter-spindles which are automatically guided around the surfaces of the work as a tracer at the top of the machine follows the outlines of a templet. At the time that the photograph was taken, the cutters were engaged in milling a flat top surface. When that cut is com-

Fig. 4. Contour-milling Three Extractors for Anti-aircraft Guns Simultaneously on a Kellermatic

Fig. 5. Equipment for Inspecting Threads, Gear Teeth, and Other Parts of Gages and Tools

pleted, the parts are finished to the outline clearly seen on the examples that lie on the table in front of the angle-plate. This machine is set up to handle both right- and left-hand parts, two templets being provided on the work fixture, as well as the required holding means.

An extensive inspection department is maintained to insure close supervision of all work, both during manufacture and after all operations have been completed. Gages for the use of machine operators and inspectors are under the control of a separate gage department, which is equipped for the accurate determination of gage dimensions, the equipment including the Bausch & Lomb contour measuring projector seen in Fig. 5, a Pratt & Whitney measuring machine, a Zeiss toolmaker's microscope, and a Rockwell hardness tester. All gages are calibrated in a room that is kept at a temperature of 68 degrees F. the year around.

The Bausch & Lomb contour measuring projector is used for minute inspection of threads and other contours on gages, gears, jig and fixture parts, templets, cams, cutting tools, and similar parts. Five lenses are available for throwing enlarged images of the work on the projector screen, the magnification ranging from 12 to 100. In Fig. 5 the thread measuring attachment is shown on the table and an image of a gage thread appears on the screen. From this image, measurements can be made of the thread form, helix angle, pitch, lead, and other elements.

The thread measuring attachment can be adjusted to bring the threads of the image in any desired position relative to reference lines that are etched across the screen vertically, horizontally, and at an angle of 60 degrees with the horizontal. The projector screen can be turned about its center for the measurement of angles, a vernier being provided for determining readings within an accuracy of one minute of arc.

Glycerine as a Lubricant

IN a study of the role of glycerine in modern lubricants by Dr. Georgia Leffingwell and Milton A. Lesser, it is pointed out that glycerine is not only an important ingredient of many lubricants, but also has an important place of its own in the lubrication field, being suitable for use where petroleum lubricants cannot be employed. Because of its insolubility in most of the common organic solvents, glycerine is useful when such solvents are encountered. A typical lubricant is one prepared from 100 parts of oleic acid and 50 parts of glycerine.

A grease insoluble in gasoline which may be used for gasoline pumps consists of 2.5 parts of oleic acid; 17.5 parts of ammonium linoleate; 37 parts of glycerine; and 35 parts of mineral lubricating oil. Another compound used for similar purposes contains blown castor oil, glycerine, carnauba wax, and graphite.

Another lubricant insoluble in organic solvents has been developed at the University of Michigan. While intended especially for laboratory work, it is applicable in other fields as well. The directions for preparing this lubricant are as follows: Mix together, to form a thick paste, 25 parts of anhydrous glycerine, 7 parts of dextrin, and 3.5 parts of d-mannitol (c.p.). Heat slowly, while stirring, until the solid constituents are dissolved and the solution just begins to boil. To increase the viscosity, add more dextrin; to increase the fluidity, add more glycerine; to increase the greasiness, add more mannitol.

Another laboratory lubricant, which is insoluble in the ordinary fat solvents, such as the hydrocarbons or chlorinated hydrocarbons, can be made by mixing glycerine and Bentonite.

Because of their low freezing point, lubricants containing glycerine can be employed at extremely low temperatures. Glycerine was used as a lubricant in the early days of electrical refrigerators, and is still employed under similar conditions. Mixed with graphite, it makes an excellent low-temperature lubricant. In an extreme-pressure lubricant, in which dispersed candelilla wax is the major ingredient, up to 50 per cent of glycerine is added as an anti-freeze agent.

Glycerine finds many uses in lubricants for special purposes. For example, it is a regular ingredient of lubricants for rubber surfaces. Oils and greases cannot be used on the rubber shackles of automobiles because of their deteriorating effect on rubber. Instead, a mixture of two parts of alcohol and one part of glycerine is recommended. The alcohol evaporates, leaving a thin film of glycerine as a lubricant. In addition to acting as a lubricant on rubber surfaces of all kinds, glycerine prevents drying and cracking of the rubber. A patented lubricant for rubber bearings consists of a 50 per cent aqueous glycerine solution to which 0.2 per cent of finely divided graphite is added.

Glycerine is particularly important in the manufacture of explosion-proof lubricants. These are used where, due to high temperature and pressure, explosions might occur when the ordinary lubricants are used.

A cold-drawing metal lubricant is specified as follows: Dipotassium hydrogen phosphate, 20 parts; water, 80 parts; sulphonated castor oil, 1 part; and glycerine, 33 parts. This lubricant, used as a coating for iron and steel, not only facilitates cold-drawing, but also leaves a surface suitable for subsequent painting. Glycerine as a lubricant for synthetic-resin bearings is also beginning to find wide application.

Grooving Operations Performed with Haynes Stellite Tools

GROOVING operations fall into two classifications — profile grooving and slotting. These differ only in the shape of the groove formed; but good practice calls for a marked change in surface speed and rate of feed, depending upon the ease of chip removal and the average width of the groove. In grooving a pulley, almost twice the feed can often be used that is employed in forming a slot of the same width.

Pulley or sheave grooving is most economically done with standard solid tools, ground to the proper profile and having from 3 to 10 degrees front and side clearance. No top rake is used. A set-up using one group of tools for roughing and another for finishing cast-iron sheaves is shown in Fig. 3. Sheaves and pulleys for multiple V-belt drives can be grooved at high speeds when the tool clusters are held as shown. Note the excellent support given the individual tool bits by the tool-holder.

For hoisting drums or drive sheaves too large to make the use of tool clusters practicable, the work can be economically machined in vertical turret lathes equipped with multiple tool-holders, as shown in Fig. 2. The tools in the outer head are for rough-turning, grooving, forming the ridge, and chamfering the side ridges. The job shown is the machining of a 30 1/2-inch diameter cast-iron sheave. The grooves are 3/4 inch wide. Using a rim surface speed of 110 feet per minute and a feed of 0.068 inch per revolution, Haynes Stellite "2400" tools finished this job in a total time of 2 hours and 15 minutes. A similar job on a 48-inch sheave (Fig. 1) done in another plant uses Stellite J-Metal tools at 112 surface feet per minute; but due to the wider grooves—1 5/16 inches—the feed is reduced to 0.019 inch per revolution. It is of interest to note that the total length of the cutting edge engaged in this cut is 3 1/8 inches.

The grooving of chilled-iron fan pulleys such as are used in automotive and marine equipment is more difficult. At one plant, where these pulleys are made in quantity, a hand-feed is used, with a

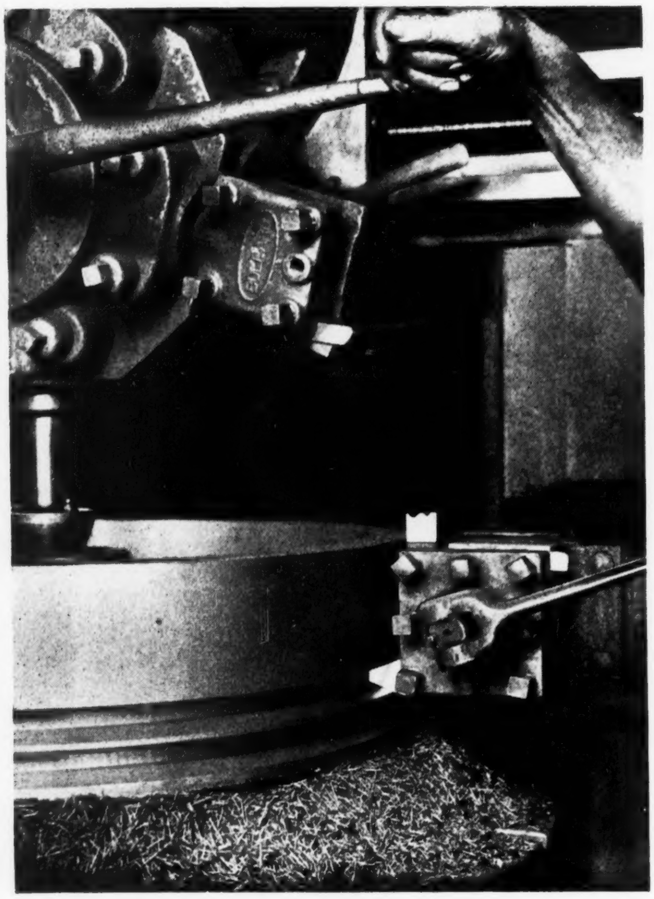


Fig. 1. Grooving a 48-inch Sheave with Stellite *J-Metal Tools

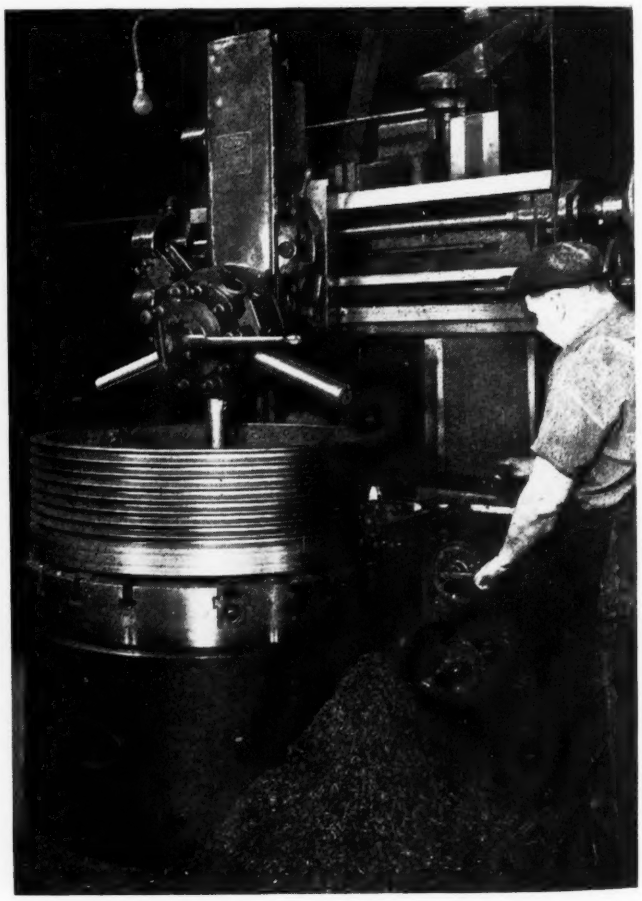


Fig. 2. Grooving a 30 1/2-inch Sheave with Stellite "2400" Tools

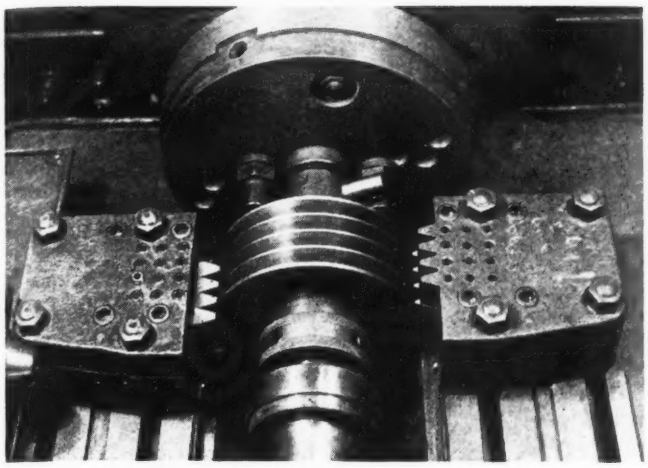


Fig. 3. Grooving an 8-inch Sheave, Four Grooves at Once, with Stellite J-Metal Tools

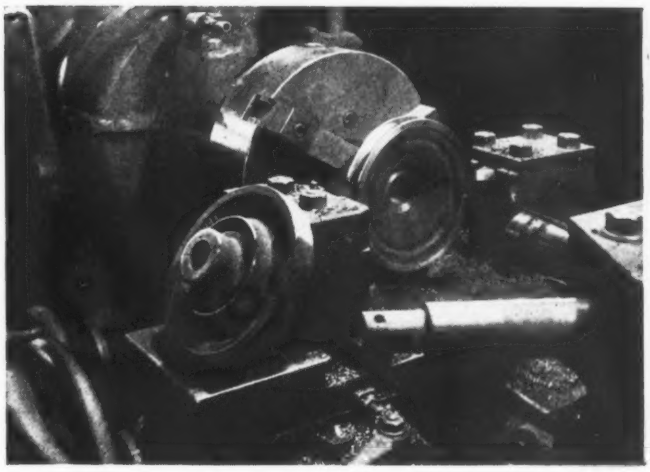


Fig. 4. Forming a Groove in a Chilled Cast-iron Pulley with Stellite "2400" Tools

surface speed of 170 feet per minute. This job, shown in Fig. 4, forms a groove 7/8 inch wide and 3/4 inch deep. Approximately 165 pieces are obtained per tool grind with Stellite "2400" tool bits.

Slotting, the more specialized type of grooving, is commonly met with in railroad work. Locomotive packing rings are made by slotting and cutting off. Tools for these operations, and for making locomotive piston-ring grooves, can be made up from standard tool bits with only a little grinding. Fig. 5 shows the grooving and cutting off of twenty-two locomotive packing rings from a rough cylindrical casting. This job is completed in 2 hours and 20 minutes. For this work, 1/4-inch square solid tool bits are used, ground with a 4-degree front clearance and a 4-degree slide clearance.

The castings are made from gun iron, and are grooved and cut off at a surface speed of 75 feet per minute with a feed of 0.011 inch per revolution. As will be seen, the four lower tools groove the cylinder simultaneously. The upper tool-holder holds a facing tool and a cut-off tool, so placed that as soon as the facing operation is completed, the cut-off tool severs the ring completely.

The cast-iron locomotive piston-head seen in Fig. 6 is bored and grooved in one operation. Cutting tool tests with steel tools indicated that with a surface speed of 40 feet per minute and a feed of 0.011 inch per revolution, a tool could not even complete one grooving cut. Stellite J-Metal tools do this work at a surface speed of 150 feet per minute and a feed of 0.033 inch per revolution. The tools machine two complete pistons before being resharpened.

* * *

South American Railway Progress

As an indication of the possibilities for increased trade in machinery and equipment for Latin America, it may be mentioned that there are 2830 miles of steam railways under construction or projected in that part of the world. Most of this is in South America, although over 800 miles are under construction in Mexico. In addition, there are over 700 miles of electrified lines now under construction or projected in Brazil alone.

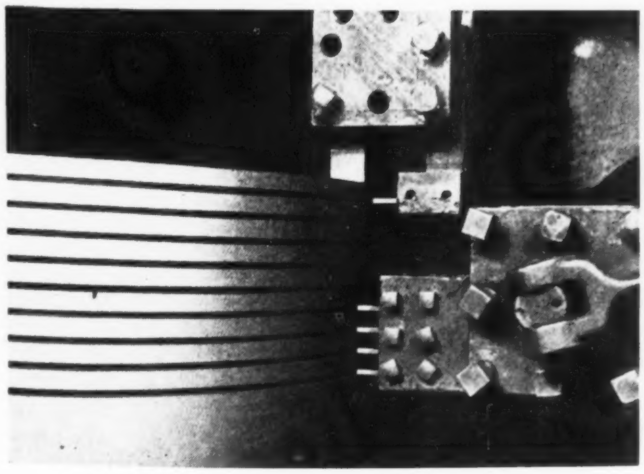


Fig. 5. Grooving and Cutting off Locomotive Cylinder Packing Rings with Stellite J-Metal Tools

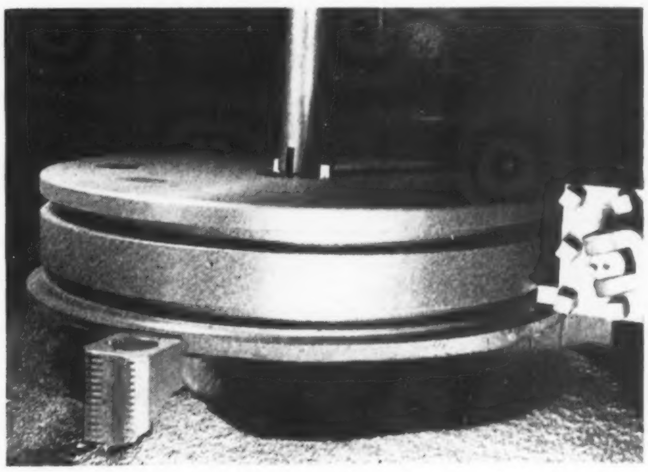


Fig. 6. Simultaneously Boring and Grooving a Locomotive Piston with Stellite J-Metal Tools

Fabrication by Arc Welding Often Requires Redesign of Parts

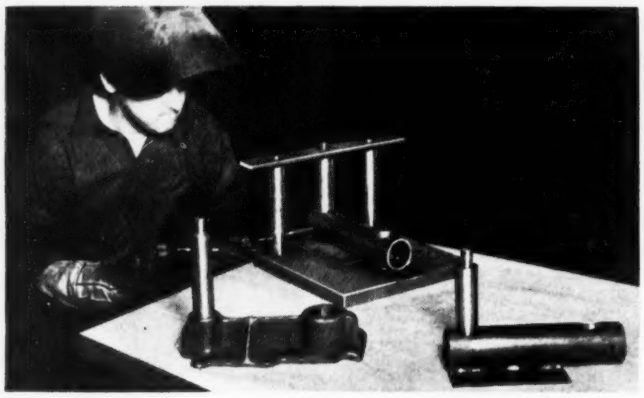


Fig. 1. Bearing for Hand Trucks Showing, to the Left, Cast and, to the Right, Arc-welded Construction. The Simple Welding Jig is Also Shown

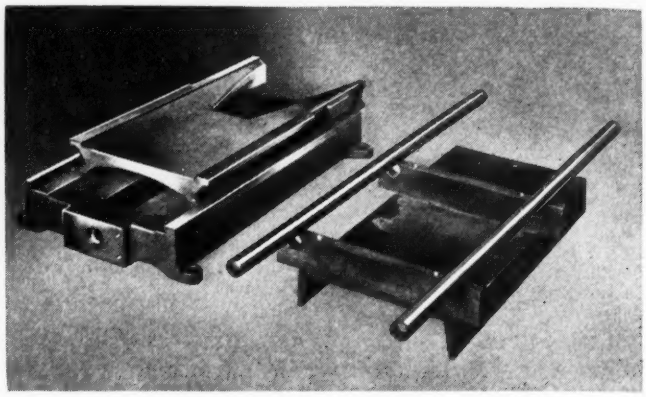


Fig. 2. The Five Pieces of Steel Shown at the Right Replace the Two Castings at the Left in the Manufacture of a Saw Carriage

A PROGRESSIVE study carried on by the Red Star Products Co., Cleveland, Ohio, to devise ways and means of manufacturing at minimum cost while retaining strength and durability recently resulted in the adoption of welded steel plate fabrication. By this means, it was found possible to produce important machine parts of lighter weight and in less time than was formerly required; these advantages were coupled with a considerable saving in cost.

The principal products of the company are a hand truck used in construction and grading work and a woodworking saw. To use welded construction advantageously, it became necessary to change the designs to adapt them to welding. A bearing used on the hand truck furnishes an example of this kind of design study. The bearing provides a mounting for the wheels. Fig. 1 shows, to the left, the bearing as previously manufactured, and, to the right, the steel arc-welded bearing. In this illustration is also shown a very simple jig in which the three parts of the bearing are placed while being welded together.

The three pieces that make up the bearing are a plate 5 by 7 by 3/16 inch in size, a pipe 2 3/4 by 10 3/4 inches, with walls 1/4 inch thick, and a

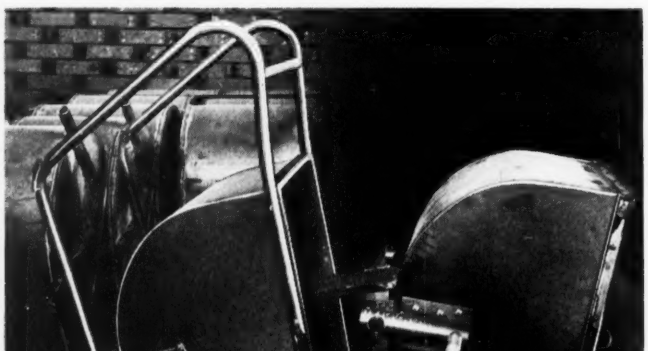


Fig. 3. The Old Type Bearing (Left) and the New Type (Right) as Applied to Hand Trucks

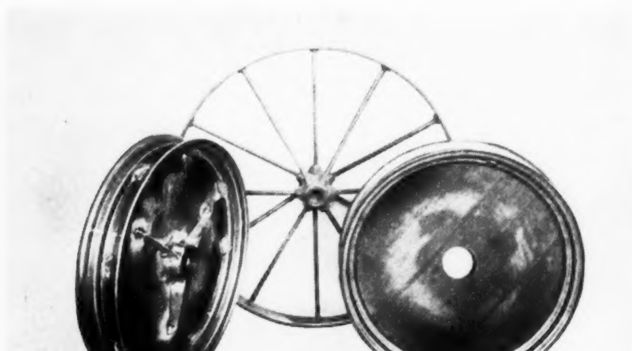


Fig. 4. Old Wheel of Cast Construction and New Welded Wheel Employed for the Trucks

piece of machined round stock which serves as the axle. This is the simplest combination of parts possible to meet the requirements. The bearing is attached to the truck (see Fig. 3) by means of the steel plate. The piece of pipe provides a support for the axle and handle, while the machined round stock serves as a bearing for the wheel.

By the use of the simple jig shown in Fig. 1, the parts are welded together in six minutes. The arc-welded steel bearing weighs 8 1/4 pounds, while the cast construction weighed 12 pounds. Furthermore, the new design eliminates five drilling operations and one slotting operation.

The wheel, Fig. 4, of which two are used on each truck, is another example of fabrication by arc welding. The wheel in the background is of the type formerly used. A study of the requirements led to the design shown to the left in the illustration. In the foreground and to the right are shown the parts of this wheel, which consist of the rim, a flat disk, a piece of pipe which serves as the hub, and six small triangular pieces of plate, which, when welded in place, provide rigidity.

The rims as purchased have an arrangement of slots for the insertion of the disk. The latter is welded to the rim by eight welds at the places where the disk registers with the slots in the rim. The hub, after being accurately placed in position, is first lightly tack-welded; then the three stiffeners are positioned on both sides of the disk and lightly tack-welded; next, the proper alignment and location of the parts is checked and the entire wheel finish-welded. Continuous welding is not employed, the various parts being joined by intermittent welds at predetermined positions. The welding was done by the Lincoln Electric Shielded-Arc process.

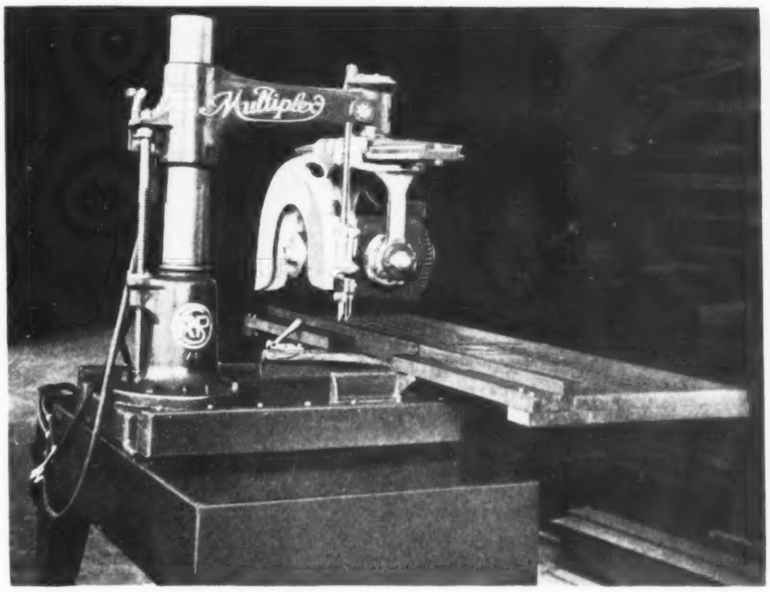


Fig. 5. The Woodworking Saw with the Cast-iron Carriage

A study of the requirements of the carriage used for the company's woodworking saw led to unusual results. The carriage formerly used weighed 150 pounds and was composed of two heavy castings which required three days to machine. The present assembly is composed of two pieces of shafting, two lengths of bar stock, and one channel. When arc-welded, this assembly weighs only 88 pounds and requires only one-half day for machining. Fig. 2 shows the old and the new carriage side by side.

Figs. 5 and 6 show the application of the two carriages to the saw, Fig. 5 showing the old type and Fig. 6 the new welded unit. The base of the saw is also fabricated by arc welding.

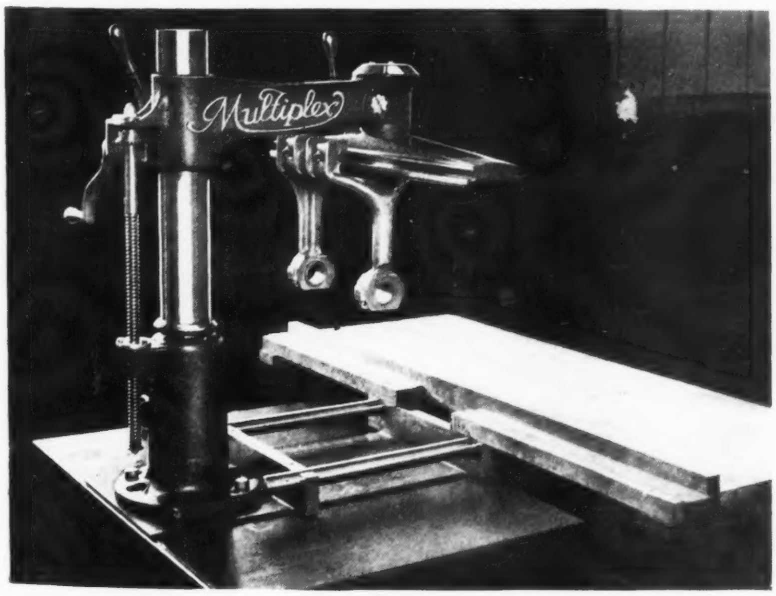


Fig. 6. Saw Shown in Fig. 5 Provided with the New Welded Type Steel Carriage

* * *

Westinghouse to Exhibit at the 1940 World's Fair

The Westinghouse Electric & Mfg. Co.'s exhibit, which was one of the major industrial attractions at the New York World's Fair last year, will reopen in 1940, according to Mr. Robertson, chairman of the board of the Westinghouse company. The 1939 Fair season was considered highly successful for the Westinghouse organization. Of the 26,000,000 visitors to the Fair, one out of every four was attracted to the Westinghouse exhibit—6,500,000 visitors in all. The exhibit will be considerably changed and improved to include the latest developments of the electrical industry, and last year's outstanding exhibits, including the Time Capsule, will be continued.

Engineering News Flashes

The World Over

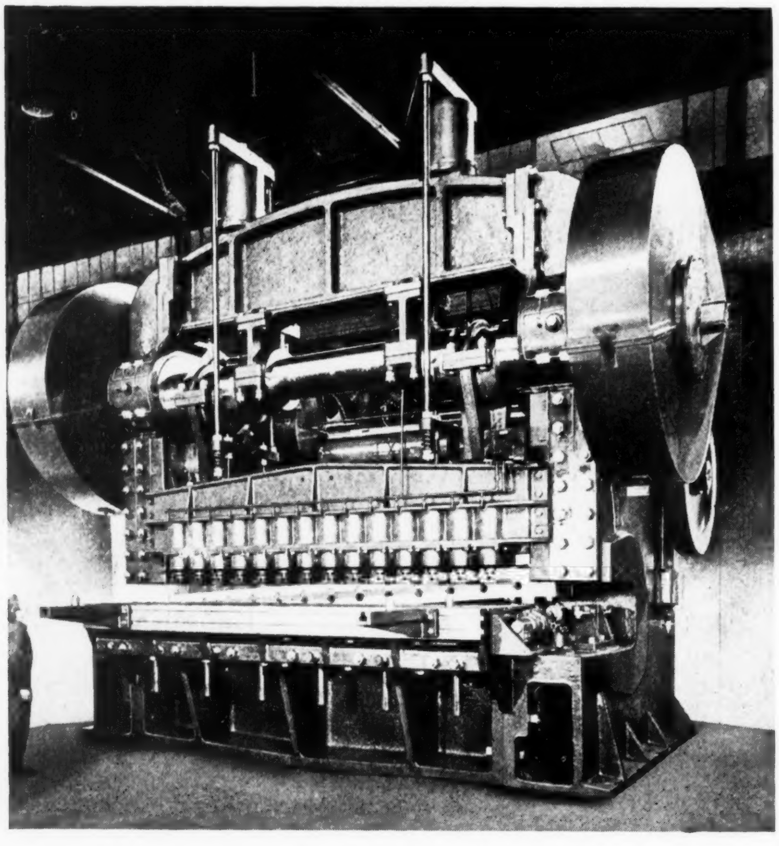
Gas Generated from Charcoal Runs Automobiles in Sweden

Owing to the fact that the supply of gasoline in most European countries has been greatly limited by the war, its use has been curtailed in a most drastic manner. The problem of providing automobile transportation without gasoline has been solved in Sweden in a manner that appears to give at least temporary satisfaction. Both the General Motors Corporation and the Swedish automobile manufacturer Volvo are providing trucks and passenger cars with gas generators that produce a gas suitable for use in automobile engines from charcoal, of which the country has unlimited supplies.

As an example of what can be done with the new motor fuel, which has been experimented with for some time in anticipation of the present emergency, it may be mentioned that a Chevrolet truck has been operated with the new motor fuel for 250,000 miles, carrying a load of from 4 to 5 tons of lumber, at a fuel cost of approximately 1.5 cents per mile. The annual maintenance cost is said to be less than $40. A General Motors truck has been run with heavy lumber loads for 3000 miles at a fuel cost of 1.4 cents per mile. On long runs, this cost has been brought down to 1.25 cents per mile. As the regular peacetime price of gasoline in Sweden would make the cost of operating this truck 4 cents per mile for fuel, it is obvious that there is a considerable saving through the use of charcoal.

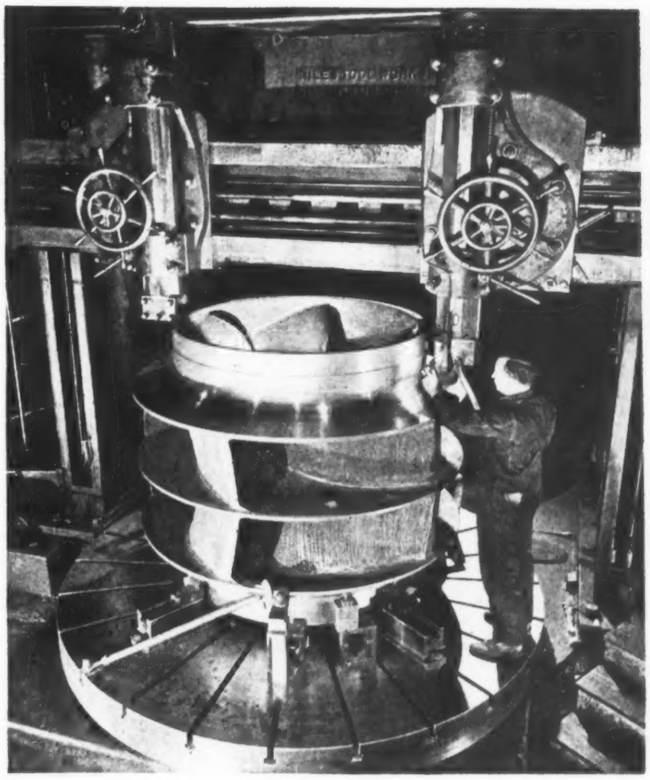
On motor trucks, the gas generator is attached back of the driver's cab, having somewhat the appearance of an old-fashioned kitchen hot-water boiler; on passenger cars the generator is attached as a small trailer. Some trucks have been provided with an extension to the cab in the rear, which houses the generator.

One drawback to the use of the new motor fuel is that the generator gas is dangerous, and health regulations prescribe that the generator must be shut off before the car is driven into a garage, and must not be started until the car has been moved out of the garage into the open air.



A Plate Shear, Believed to be the World's Largest, Recently Built by the Thomas Machine Mfg. Co., Pittsburgh, Pa. The Machine Has a Capacity for Shearing Plates up to 2 1/2 Inches Thick by 13 Feet 6 Inches Wide at One Stroke. Its Total Weight is Nearly 500,000 Pounds

Four Record-sized Single-stage, Double-suction Centrifugal Pumps have been Built by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., for the City of Chicago. The Revolving Element of the Pumps, Weighing 14,000 Pounds, is Shown being Machined in the Allis-Chalmers Plant. It is Made of Cast Iron, and is 5 1/2 Feet High by 6 1/2 Feet in Diameter



New Fume Detector Sees Invisible Shadows

A shadow cast by the poisonous invisible fumes of mercury can now be detected by an apparatus recently developed in the research laboratory of the General Electric Co., Schenectady, N. Y. Invisible to the human eye, the mercury vapor is subject to the physical law that any vapor will absorb the same color of light that it emits. Since mercury's emitted light is blue and ultra-violet, the new fume detector uses a lamp producing these colors. When samples of the air are being tested, the mercury vapor will absorb the light from the lamp and cast a shadow. While this shadow is too slight to be visible to the human eye, it is detected by a photo-electric tube upon which it is directed. Furthermore, the actual amount of mercury, which bears a relation to the depth of shadow cast, is measured by the apparatus. As little as one part of mercury vapor to one billion parts of air can be clearly detected.

Climatic Tests Applied to Delicate Engineering Equipment

The constant search for better metals, alloys, and materials to withstand weather conditions has led the Westinghouse Electric & Mfg. Co. to install what are known as "weather boxes." Instruments that must work unfailingly in any climate are tested in these boxes. The tests can be carried on in typical "climates," ranging from the moist heat of Amazonian jungles to Arctic cold of 60 degrees below zero. Intense cold is produced by mechanical refrigeration supplemented by dry ice. Tropical heat is produced in a sealed chest with double doors and outside control panel. The temperature can be kept at almost any level, and the operation is almost entirely automatic over long periods of time. For "tropical jungle" tests, the temperature is set at 100 degrees F., and the relative humidity at 95 per cent.

Roller Bearings Applied to Rock Island Steam Locomotives

Fifty-five main-line steam locomotives of the Rock Island Railroad are being provided with Timken roller bearings; forty of these are freight locomotives and fifteen passenger engines. In embarking on this extensive program, the Rock Island Railroad was guided by the results obtained with ten locomotives equipped with Timken bearings two years ago. Considerable maintenance savings, increased monthly mileages, and greater availability for service are among the results recorded. During the last two years' operation, the ten roller-bearing equipped locomotives were compared with ten similar locomotives provided with ordinary bearings. The maintenance savings with the roller-bearing locomotives amounted to 8.2 cents per mile per locomotive, or 42 per cent. The average mileage increase was 3516 miles per month per locomotive, or a 70 per cent increase.

Pressure Vessels of Large Proportions are Now being Welded

Pressure vessels 35 feet long and 7 feet 6 inches in diameter are now being welded. Several large vessels of this type have been constructed by the Ben Sibbitt Iron & Foundry Co., Wichita, Kan., for a western petroleum refinery. These vessels were fabricated from 3/8-inch flange-quality steel plate. The heads were constructed of 1/2-inch steel plate of the same quality. All seams were butt-welded with General Electric equipment.

After fabrication, the vessel was given a hydrostatic test with water at a pressure of 150 pounds per square inch and a temperature of 60 degrees F. With this pressure on the vessel, it was hit sharply on each side of each seam at 6-inch intervals with a 3-pound hard brass hammer. The vessel was also tested according to standard specifications; it showed no signs of leaks or sweats.

EDITORIAL COMMENT

Increased Employment Requires Increased Capital Investments

The book entitled "Capital Goods and the American Enterprise System," recently published by the Machinery and Allied Products Institute, is of such importance that it should be called to the attention of every man engaged in industry who is interested in the economic welfare of the nation. This book lays down the economic principles essential to increased employment in the United States, and points out the basic conflict between a spending policy and a program of saving and investment in productive enterprise. It contains a great deal of detailed information on the capital-goods industry and its relation to the American industrial system. It points to the fact that the financial resources available to business enterprise have been seriously reduced—so seriously that by the end of 1938 there was a deficiency of $61,500,000,000 in business savings.

New security issues in recent years have averaged only 17 1/2 per cent of the average annual volume during the 1920 decade. The use of bank credit has also declined drastically. Furthermore, it is pointed out that the years of depression since 1930 have seen an unparalleled obsolescence in the manufacturing equipment facilities of the country. American industry as a whole has actually been unable to keep up with technological progress. This retarded advance, the increasing physical deterioration of existing facilities, the unfilled need for goods arising from the growth in population, and the reduction in what should have been a normal expansion in the per capita volume of available goods have created the greatest deficiency in manufacturing facilities that the country has ever known, considering the increase in population and consuming capacity.

We Must Return to a Policy of Saving Instead of Spending

"The way to recovery, employment, and prosperity in America lies in supplying this deficiency," say the authors of the book. Several pages are devoted to a discussion of the over-saving and under-consumption theory, and legislation related to the policy of spending and discouragement of saving is analyzed in detail.

"Government in the United States," says the book, "has attempted in recent years to control and direct the economic activities of the country rather than to regulate them rationally for the promotion and development of competitive private enterprise. As a result, private enterprise has lagged seriously. The freedom and energy of individual initiative are essential to regaining America's normal ability to provide a steadily rising standard of living and gainful employment for all seeking it. This end requires that the irrational interference in the normal functioning of private enterprise shall be avoided, and that the abnormalities resulting from past mistakes shall be corrected. To a large extent, future recovery measures must be directed toward undoing what has been done improperly rather than doing things left undone."

Thirty Cents Out of Every Dollar Earned Goes for Taxes

There is probably no more generally accepted fallacy than that it is only the well-to-do who pay taxes. True, they are the ones who pay most of the direct taxes, and who, therefore, know what they are paying; but everybody who buys food or clothing, pays rent, uses railroads, buses or street cars, electric light or gas, automobiles and gasoline, pays taxes—and big taxes, too. Since the law-makers believe, however, that it is better if the voters do not know that they are being taxed, the taxes the great majority of us pay are indirect. At the present time, about thirty cents out of every dollar earned in America is taken in taxes by federal, state, and city governments.

The average industrial worker is not aware of this. His welfare, and the welfare of industry and of the nation as a whole, can be promoted by calling his attention to this fact. Here every employer has an opportunity to do some educational work. If the industrial worker were fully aware of the tax burden that he carries, he would be less likely to endorse the programs of lavish spending in which, at present, all governmental agencies, from the City Councils to Congress, are engaged.

The more the Government takes, the less there is left for the individual. The more people that are supported by Government payrolls, the more must be taken out of the worker's pay envelope by hidden taxes. The people supported by the Government are actually supported by the men and women who do productive work in shops and factories.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

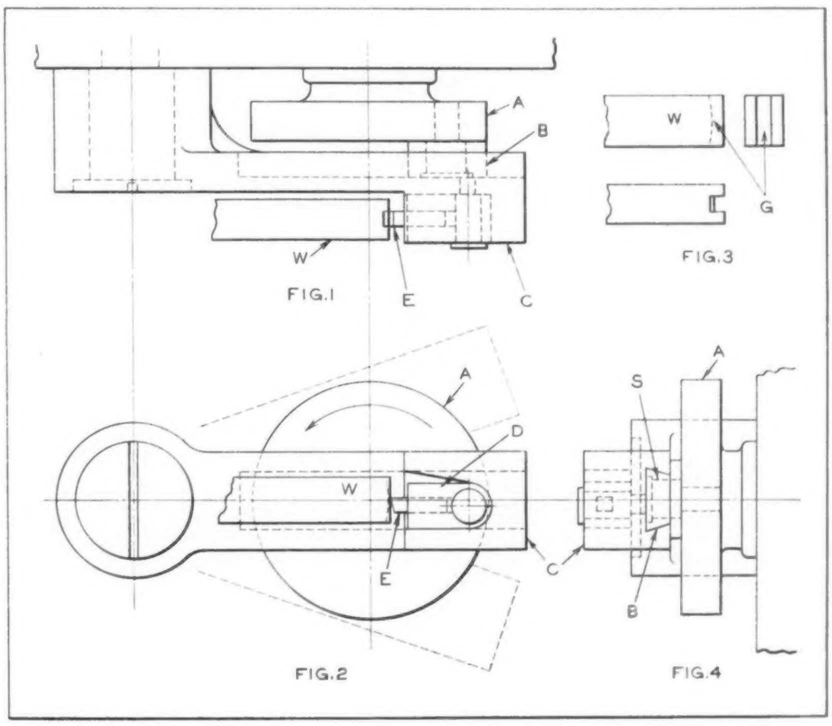
Oscillating Mechanism for Milling Machine Shaping Attachment

By L. KASPER

The oscillating mechanism shown in Figs. 1, 2, and 4 of the accompanying illustration actuates a slot- or groove-shaping attachment for a milling machine. The grooves *G* to be cut in the ends of bars *W*, Fig. 3, have their bottom surfaces machined to conform with an arc of a circle. The milling attachment was designed to handle this machining operation, because the bars were too long to be handled in a lathe.

Referring to the oscillating mechanism, the disk *A* is driven by the spindle of the milling machine, and carries a block *B*. Block *B* is free to swing on its stud *S*, and slides in a dovetail groove at the rear of lever *C*. Lever *C* is free to swing on its stud, which is fastened to the column of the milling machine. The rotation of disk *A* in the direction shown by the arrow imparts an oscillating motion to lever *C*, as shown by dotted lines in Fig. 2, which indicate the two extremes of the oscillating motion.

The block *D* which carries the tool bit *E* is fitted into a recess in the front of the lever *C*, as shown in Fig. 2, and is free to swing on its stud. In this view, the tool bit *E* is shown in position for cutting, with the block *D* resting on the lower edge of the recess in lever *C*. The cutting action takes place on the upward swing of lever *C*. As the lever swings toward the bottom, the block *D* turns on its stud to prevent the cutting edge of the tool bit from dragging on the non-cutting half of the oscillating movement. Thus block *D* operates in the same manner as the clapper block of a shaper. The work *W* is supported by clamping it on blocks on the milling machine table, the longitudinal feed being employed to advance the work to the shaping tool.



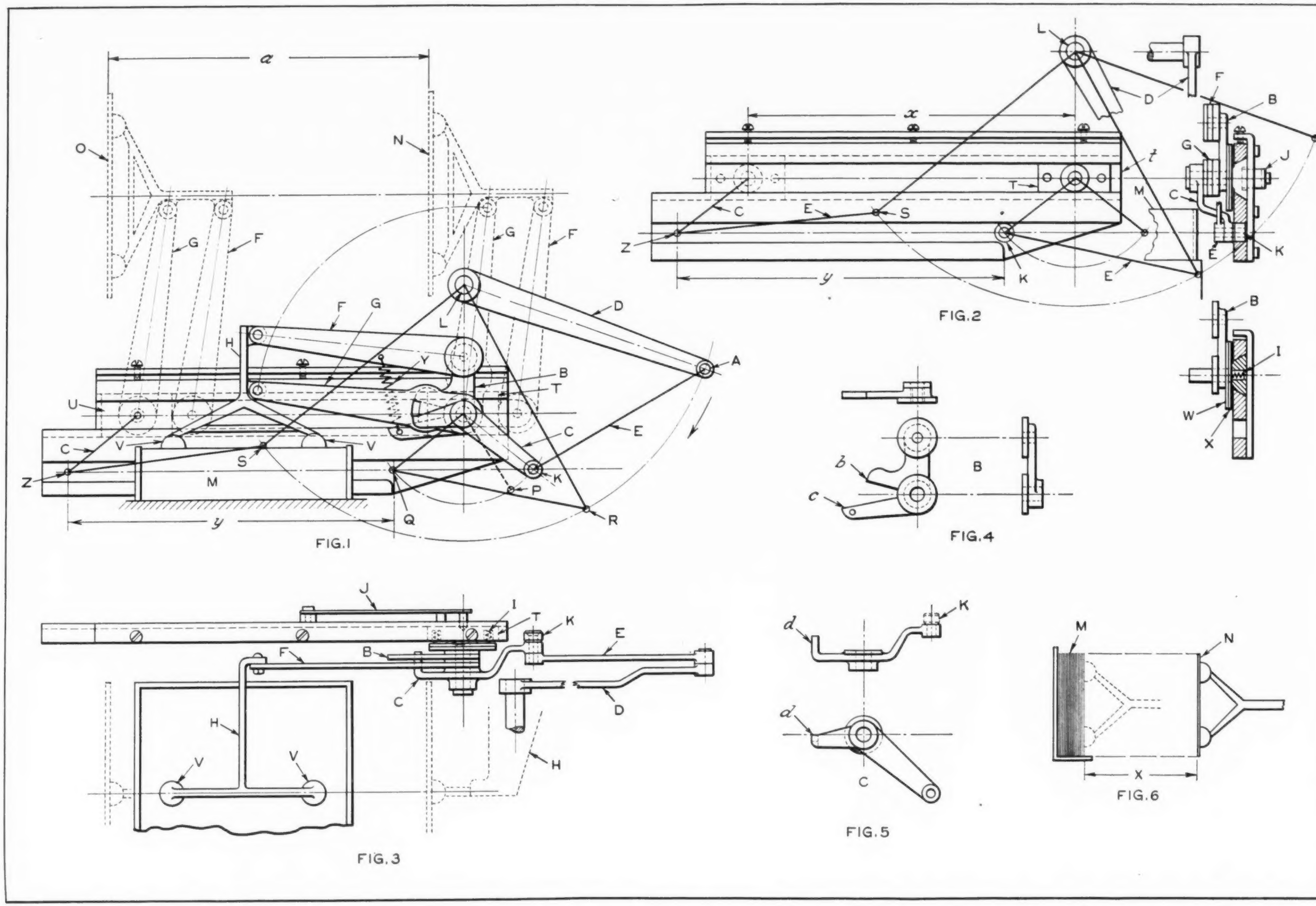
Figs. 1, 2 and 4. Mechanism Applied to Milling Machine for Oscillating Shaper Tool Used to Cut Groove G in Work W, Fig. 3

Mechanism for Picking up and Transferring Thin Plates

By M. JACKER

The mechanism shown in the accompanying illustration is designed to pick up thin polished metal plates from a magazine, one at a time, and convey them to a vertical feeding position. The operation of transferring the plates, as indicated in Fig. 1, is accomplished by employing a pick-up arm *H* fitted with vacuum cups *V*, which are lowered into contact with the top plate in the magazine at *M*. The plate held by the vacuum cups is next swung upward to the vertical position indicated at *N* and then moved forward a distance *a* to the feeding position *O*, where it is released by a valve which is operated automatically to break the vacuum in the cups *V*.

When the mechanism is in operation, lever arm *D* is made to oscillate from *A* to *S* about its fixed center at *L* by means not shown in the illustration. This motion, through the medium of the connecting-



Mechanism with Vacuum Cups V which are Automatically Lowered to Pick up a Metal Plate from Magazine M, Raise it to Position N, and then Advance it to Position O

rod E, is conveyed to bellcranks C and B, which are also shown in Figs. 5 and 4, respectively, and to parallel bars F and G, and finally to cross-head T, when bellcrank roller K enters the guide groove at Q. Lever arm D moves from R to S while the roller moves from Q to Z.

It will be noted that the two parallel bars F and G swiveling at their four end joints provide a parallel motion which causes both vacuum cups V to touch the plate in the magazine at the same time, whether the plate is at the top or bottom of magazine M. Bars F and G have wide ends where they swivel on bellcrank B, in order to resist the twisting strain caused by the overhang of the plate-lifter.

In the lower sectional view, Fig. 2, is shown a friction disk W fastened to bellcrank B and a similar disk X held stationary on the cross-head, but given a frictional contact with disk W by means of two helical springs I located in recesses in the cross-head. This arrangement holds bellcrank B in the various positions to which it is moved by bellcrank C.

In Fig. 1, vacuum cups V are shown resting on the first top plate in magazine M with lever D, connecting-rod E, and bellcranks B and C in their correct positions for this location of the vacuum cups. A clearer view of cross-head T and roller K, with their respective guides, is shown in Fig. 2. The lever arrangement in relation to plate magazine M is shown in the plan view, Fig. 3. When lever arm D moves in the direction indicated by the arrow, Fig. 1, and its connecting-rod E has moved bellcrank C to point P, then end d of bellcrank C, Fig. 5, will be at the top of the slot in the lower parallel bar G and in contact with point b on bellcrank B, Fig. 4. The parallel bars in the meantime remain at rest.

Next, lever arm D continues its movement to point R and roller K on bellcrank C arrives at Q. These combined contacts and motions cause bellcrank B and parallel bars F and G, with one of the plates from the magazine, to be raised into the position shown by the dotted lines at N. To prevent cross-head T and its levers from sliding to the left during this motion, a holding spring J, Fig. 3, is provided which has a beveled end that snaps into a beveled recess in the back of the cross-head.

When the mechanism has reached this stage in the operating cycle, guide roller K of bellcrank C is just about to enter its horizontal guiding groove. During the remaining oscillating motion of lever D from R to S, cross-head T is pushed from the position in which it has been held by spring J to its final position U, having traveled the distance x, Fig. 2, while guide roller K has traveled the same distance y. Thus the plate has arrived in its second and final position, where the air suction is released from the vacuum cups, causing the plate to be dropped.

Lever arm D next returns to its starting point. When it arrives at R, roller K is just leaving the guiding groove at Q and the cross-head has again become locked by spring J. A positive stop is also provided at t, Fig. 2, which prevents any further movement to the right. As lever D continues to its starting point, it moves bellcrank C with it, causing the end at d (Fig. 5) to strike end e of bellcrank B, Fig. 4. While this motion takes place, coil spring Y stretched between c and bar F causes the bars to move slightly from their vertical position until the top of the slot in bar G rests against d. From this point, the parallel bars and both bellcranks move together until the vacuum cups hit the uppermost plate of the stack in magazine M. This will happen when bellcrank C is somewhere near point P. When bellcrank C reaches the end of its travel, its end d will be resting in the bottom of the slot in bar G, if magazine M is full; but if only one or two plates are left in the magazine, the top of the slot in bar G will continue to rest on point d until the end of its travel is nearly reached.

A somewhat different solution to the plate feeding problem is to stack up the plates vertically in a magazine, as indicated at M, Fig. 6, at a point a little to the left of the feeding position N where they must be released. With this arrangement, only a pick-off mechanism with a back-and-forth horizontal movement would be required. Such an arrangement would, of course, eliminate considerable mechanism.

* * *

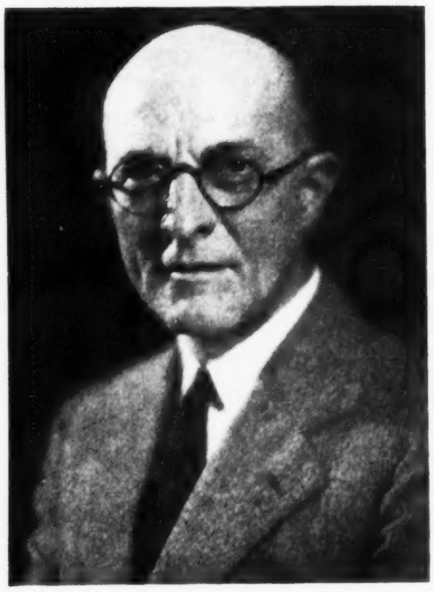
Census of the Machinery Industries

Early in January, the Bureau of the Census started to collect the facts and figures relating to the activity of the manufacturing industries in 1939, including all classes of machine-building. Approximately 12,000 census takers began calling on manufacturers and distributors throughout the United States.

In addition to the figures on production and the cost of manufacture, materials, and labor, the Census of Manufactures this year will record data never before collected on the expenditures during the year for new machinery and operating equipment, plant expansion, and alterations. It will also record, for the first time since 1929, the number, capacity, and value of prime movers and generators, as well as the cost of electric energy and fuel consumed by manufacturing plants during the year.

To make certain that the information to be collected is as valuable as possible to industry, the Bureau of the Census has obtained the advice and cooperation of manufacturers in formulating the questions to be asked. As the value of the information will depend largely upon its timeliness, the Bureau is speeding its compilation and asks full cooperation from manufacturers in filling out forms and questionnaires. With such cooperation, it is believed that the compilation of the Census of Manufactures can be completed by May or June.

Standard Tools are Breaking Production Bottlenecks



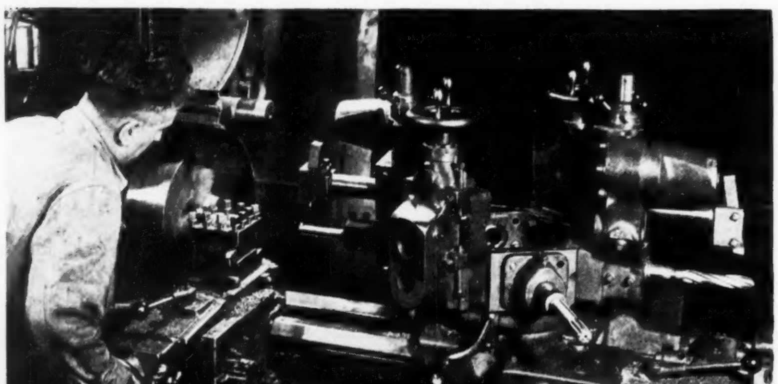
By WILLIAM J. BURGER
Works Manager, The Warner & Swasey Co.
Cleveland, Ohio

ALTHOUGH everyone hoped another war would be postponed, the inevitability of such a conflict was apparent for such a long time that when it finally came, American industry was much better prepared than was the case in 1914. In the long run, war does no one any good. Yet it has come, bringing with it such activity in a number of industries that most of the plants affected were not fully prepared for the rush, despite the long warning. These plants are suddenly faced with more orders than they have had in years, and with shops operating at capacity, the big problem is how to turn out more work.

In relieving the bottlenecks, it often seems necessary to purchase additional equipment; but many times this is not possible or expedient. In any event, no one wants to risk the danger of over-expanding in equipment if there are other ways of increasing production. Certainly everyone is attempting to get the very most out of available equipment by improvements in tooling. Yet the matter of improved tooling brings up another problem. Increased production has put a premium in most shops on both experienced tool designers and skilled toolmakers. Under these circumstances, it is more than ever important to heed the equipment manufacturers' admonition, "Don't overlook the advantages of standard tooling and attachments."

Much has been said on the subject of standard versus special tooling—about the advantages of buying well engineered tools designed by experts in preference to building homemade tools in the shop. On this subject nothing further need be said here; but in the case of an emergency such as exists in many plants today, new factors that assume a great deal of importance enter the picture. This is especially true in the case of turret lathe tooling, which is the type of tooling the author knows most about.

The first factor that grows out of the situation has already been mentioned. Experienced tool designers and skilled toolmakers required to make special tools are difficult to get. By buying standard tools from equipment manufacturers, however,



The Six Standard Tools Most Generally Attached to the Hexagon Turret for Chucking Work are Two Adjustable Single Turning Heads, Two Slide Tools, and One Long and One Short Flanged Toolholder. Even when All of These Tools are not Needed, it is Usually Possible to Keep Them on the Turret

it is possible to pass the burden of building tools and all its grief to these suppliers. A certain amount of special tooling is essential in every shop. It is only common sense, therefore, in an emergency, to free the tool designers and toolmakers of work that could be eliminated by simply ordering equipment from a catalogue, and thus leave these departments with only the jobs that require special work.

Another important factor is that of saving time. All the better equipment manufacturers carry complete stocks of standard tools. This is especially true in the turret lathe field. It is possible to select a tool or set of tools from a catalogue and have them on hand within a day or two—even sooner if branch or factory warehouse stocks are near by. There is no time lost while the tools are being designed and built. Not only that, but once the tools are on hand, they are ready to be put into actual production, because standard tools are designed and built properly. The troublesome kinks that always develop with new tooling have already been ironed out. Little, if any, production time is lost by an operator's experimenting on his machine—an important matter these days when over-time costs are way up.

A third important factor is the time saved in changing over from job to job. Special tools, as the name indicates, are usually not very flexible. Designed for one particular job, they generally have to be taken off the machine when that job is completed and replaced by others for succeeding work. Modern standard tools, on the other hand, have been designed to do several different types of work.

Probably the leader in the development of such widely universal standard tooling is the turret lathe industry. Turret lathe builders have found, over a long period of time, that most jobs can be done with a relatively small number of tools; and in the last few years they have developed these tools and the technique of utilizing them efficiently to a point that far surpasses anything known heretofore. These universal tools are the result of many suggestions made by customers, operators, and manufacturers' service men in the field, as well as home office engineers. Many of them originated as a special tool, designed to do a job no standard tool could do, but because of its original success, it was improved and made available to other users. The success that the Warner & Swasey Co. has had with these universal standard turret lathe tools in its own manufacturing operations is typical of that of other manufacturers who have tried them.

Two sets of these tools are used—one set for bar work and one for chuck work. In a large shop, each machine is equipped with either one set or the other—it is never necessary to have both. This, of course, is because, in most cases, machines are assigned to either one type of work exclusively or the other. In small shops or departments, however, both bar and chucking equipment are usually necessary for each machine.

When set down on paper, the matter of standard universal tooling seems almost obvious; yet it is surprising to find so many visitors to the Warner & Swasey plant stopping to learn more about them. There is no question but that there are still a large number of homemade tools in the average shop. Certainly it would seem that, in times like these, when the demand is for extraordinary production and hence, more than ever, for maximum operating efficiency, shop executives would do well to investigate the matter of standard universal tooling.

* * *

Is Hard Work Undesirable?

Two tendencies of the past decade disturb me deeply. The first is the inclination on the part of a considerable proportion of our people, particularly the younger group, to feel that hard work is undesirable. This has been caused largely by the accent that has been placed on shorter working hours. While I have no quarrel with a gradual lightening of the work load as a dividend of industrial civilization to its citizens, I do deplore the philosophy that hard work of itself is undesirable. My forty years of active business life have convinced me that contentment comes only to those who, interested deeply in the work they are doing, give it the best that is in them. After all, it is inspired, unmeasured effort that has given this country its place in the sun.

The second tendency which disturbs me is the course that the accent on security is taking. Naturally, every individual seeks security. But security is not an inherent right of the individual. It is a prize that can be gained and should be expected only in proportion as the individual has earned it. Our forefathers did not come to this country to seek security. They came to find freedom, and by gaining freedom they established security in its true form.

Dependency must not become a habit in America. I do not say that only because industry cannot restore recovery and at the same time pay the taxes necessary for such dependency. I say it because such leaning on the state destroys the moral fiber of the people and must ultimately undermine their economic morale, their initiative, and their self-respect.

There is a temptation, under such distressed circumstances, to believe the toothsome untruths and beguiling doctrines imported to befuddle a suffering people. Particularly damning is the danger that youth, having never known the blessings and opportunities of the private enterprise system, will believe the infectious ranting of the radicals when they brand business as out-moded and incapable of making the grade. It is a stark social fact that an entire decade of youth that has grown to maturity since 1929 has never had a taste of real American prosperity.—*Howard Coonley in his annual report as president of the National Association of Manufacturers*

Some Novel Operations in Making a Spot-Light Lamp

By M. J. GOLDSTEIN

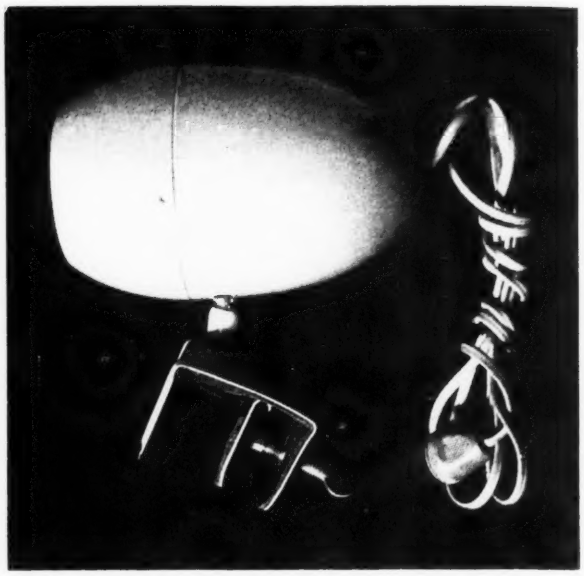


Fig. 1. Spot-light Lamp with Body Consisting of Two Drawn-steel Shells

SOME interesting and unusual operations are performed in making bullet-shaped spot-light lamps like the one shown in Fig. 1. All together, thirty-two operations are required in producing the lamp, in addition to the electrical wiring and lacquering operations. With the exception of the latter, practically all the operations are performed on punch presses.

The bullet-shaped body of the lamp consists of two drawn-steel shells shown at *G* and *M* in Figs. 2 and 3, respectively. The successive steps in forming these two parts are illustrated in Figs. 2 and 3. The dies employed are shown in Fig. 4.

First, attention is called to the unusual method employed in oiling the steel blanks preparatory to the forming or drawing operations. Having found that the old hand method of oiling blanks was unsatisfactory, because either too little or too much lubricant was applied, the writer equipped an ordinary clothes-wringer for the oiling job. The rollers of the wringer were covered with one layer of canvas, held in place by small carpet tacks. The wringer is run at a speed of 100 R.P.M. by a 1/4-H.P. motor. Ordinary machine oil with an addition of 20 per cent lard oil is used for the blanks, which are run through the wringer. Oil is applied to the canvas-covered rollers from an oil-can, an occasional application being all that is required. The shell *G*, Fig. 2, for the lamp body is drawn from a 22-gage (0.025 inch) steel blank 8 1/2 inches in diameter. The first operation on the 0.025-inch thick material is performed by the die shown at *A*, Fig. 4. The shell drawn on this die is shown at *A*, Fig. 2. It is 5 inches in diameter, 2 3/4 inches deep, and has well rounded corners at the closed end.

At *B*, Fig. 4, is shown the die used for reducing the shell produced in the first operation to the shape shown at *B*, Fig. 2. The shell is reduced in this operation to a diameter of 4 inches. The reduction is made for a length of 3 inches, leaving a 1/2-inch flange at an angle of 45 degrees, this being the angle on the reducing die and blank-holder.

The dies for the third and fourth operations, which form the shells to the shapes shown at *C* and *D*, Fig. 2, are not illustrated, as they are similar to the second-operation die shown at *B*, Fig. 4, except for size. In the third operation, the shell is reduced for a length of 1 3/4 inches to a diameter of 3 3/8 inches. This reduction is shown in the view at *C*, Fig. 2.

The fourth operation is the last before the shell

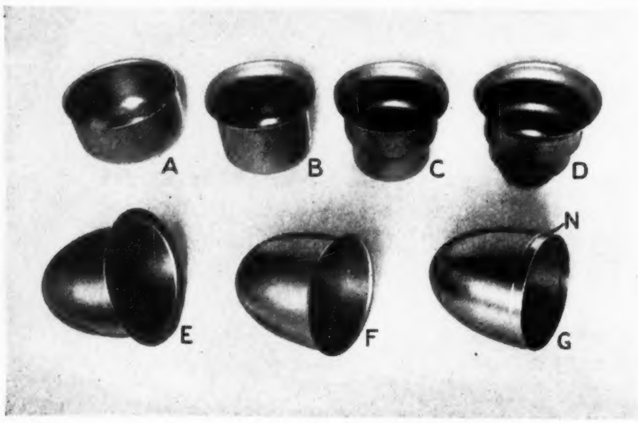


Fig. 2. Successive Steps in Forming Bullet-shaped Rear Part of Lamp Shown in Fig. 1

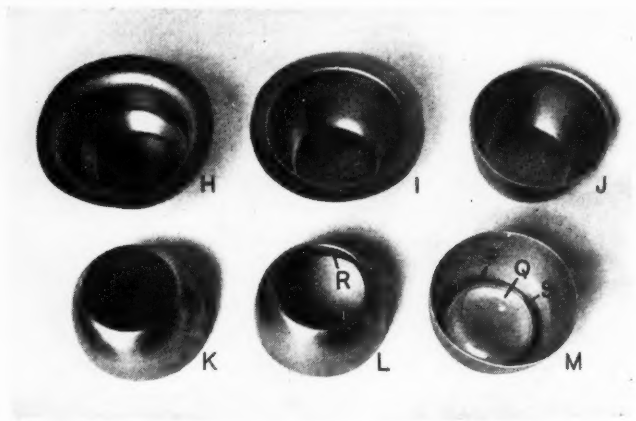


Fig. 3. Successive Steps in Forming Front or Lens-carrying Part of Spot-light Lamp

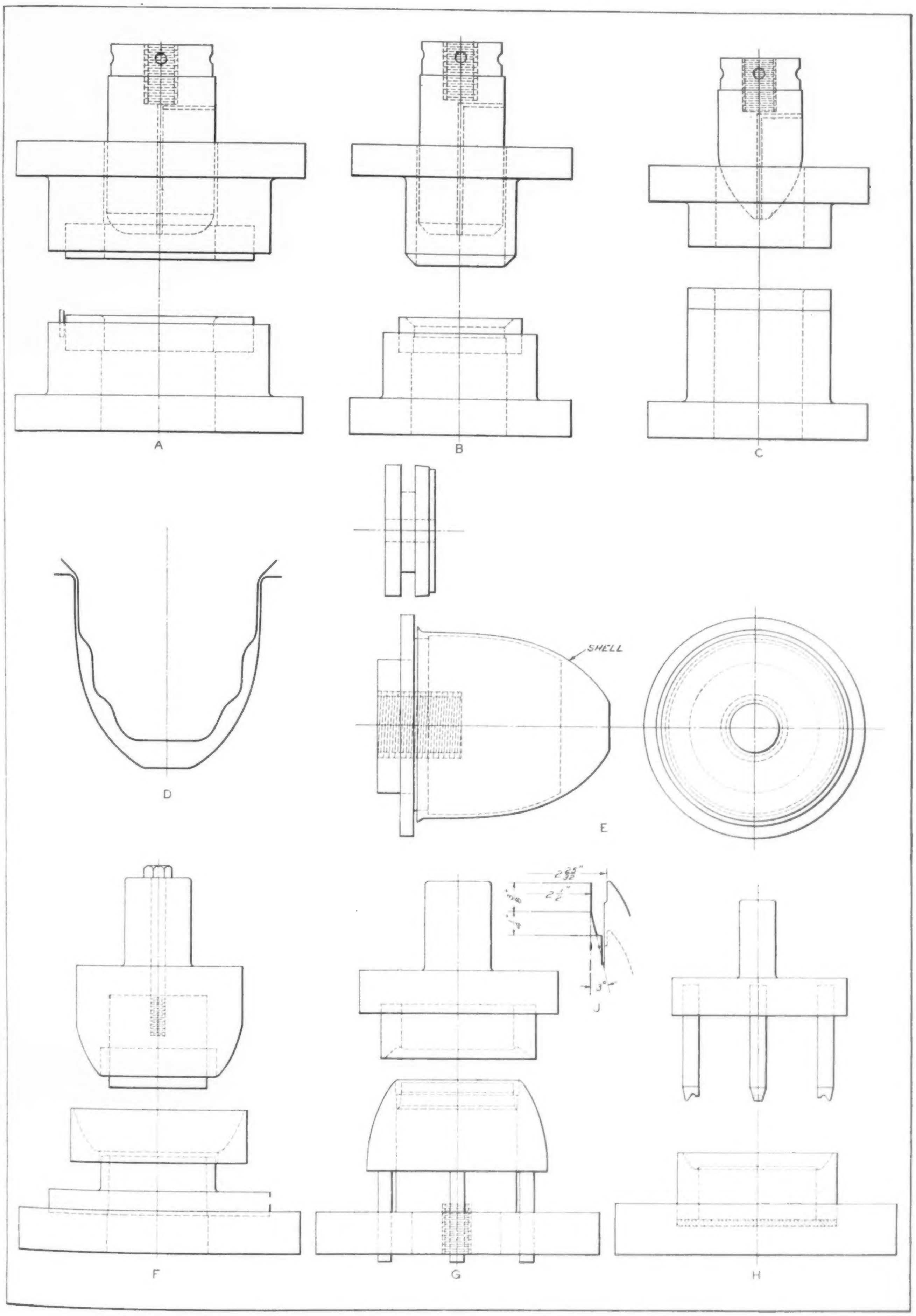


Fig. 4. Dies and Rolling Tool E Employed in the Production of Steel Shells G and M, Figs. 2 and 3

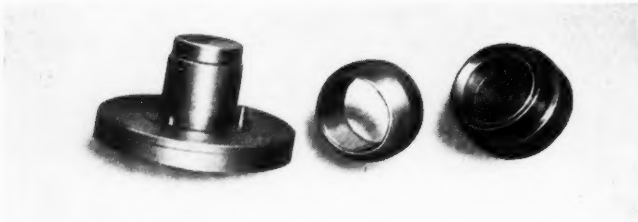


Fig. 5. Die Shown at G, Fig. 4, with Locating Ring Removed

is stretched to its final shape. In this operation, the shell is reduced for a length of 1 inch to a diameter of 2 1/2 inches, as indicated at *D*, Fig. 2. The end of the punch is well rounded, whereas the ends of the other reducing punches had 45-degree chamfers. The shape of the shell before and after the final or fifth forming operation is shown by the two cross-section outlines at *D*, Fig. 4.

The final operation is accomplished on the cast-iron die shown at *C*, Fig. 4. This die has a facing ring of tool steel, which is hardened and ground. The blank-holder is of cast iron. This construction has been found advantageous, as the stretching of the steel and the slipping action over the edges of the die tend to enlarge the die opening. It was also found necessary to pack-harden the punch, as wear was noticeable on the points where the greatest stretch occurred in the shell. This wear became evident after about 10,000 shells had been made. When the die is in operation, the shell is simply dropped into the die opening. The blank-holder clamps the shell, flattening out the 45-degree angle flange and holding the shell by this flange while the punch enters the shell and forms it to the required shape. A comparison of the shell before and after the forming operation can be made by referring to the views *D* and *E*, Fig. 2, and the view at *D*, Fig. 4. The next operation consists of trimming the shell, leaving a small flange of about 3/32 inch, as shown at *F*, Fig. 2.

A rather unusual operation is performed next, which consists of rolling the shoulder on the shell, as shown at *N*, Fig. 2, forming the reduced part with a taper of 3 degrees. The rolling action smooths the upturned edge produced by the trimming operation. At *E*, Fig. 4, are shown the chuck and roller used for rolling the shoulder at the end of the shell. The chuck is mounted on a lathe spindle, and has a flange 5/16 inch thick against which the shell is pressed by a ball-bearing block held in the tailstock. The roller shown above the chuck has a corresponding groove which fits over the 5/16-inch flange on the chuck with a clearance of 0.002 inch. This flange serves to hold the roller in a fixed relationship to the chuck and insures uniform results. The chuck is, of course, made smaller than the shell to permit removing the shell after the shoulder is rolled. The completed shell with the rolled shoulder *N* is shown at *G*, Fig. 2.

The front part of the lamp body, shown at *L* and *M*, Fig. 3, while not difficult to draw, is made from a 22-gage (0.025 inch thick) steel blank 7 inches in diameter. Several novel methods are employed in producing this part. In the first operation, the blank is drawn to the shape shown at *H*, having a diameter of 3 3/4 inches and a depth of 2 inches. The die used for this operation is similar to the one employed for the first shell, except that it has a larger radius on the drawing edge, in this case 1/2 inch. Actually, the shell is formed to shape in the die used for forming the first shell, a different punch being used for the second shell. The shell, as formed in the second operation, is shown at *I*.

The shell is next trimmed, as shown at *J*, employing the same die as was used for the first shell. From the trimming operation, the shell is passed to the forming die for straightening the small flange left on the edge of the shell. The shell is thus produced without the extremely sharp edge that would result from drawing it to the full depth and then trimming it to length. The trimmed shell *J* is shown at *K* as it appears after being finish-formed.

A rather difficult problem was met in making the recess at *P*, view *M*, for holding lens *Q* in the shell. The opening for the lens had to be cut and the edge formed back on itself, as shown at *R*, view *L*. This was done in the die shown at *F*, Fig. 4. The shell is located in the nest of the die which also acts as a stripper. The punch cuts a blank 2 3/16 inches in diameter from the bottom of the shell and continues downward, causing the edge of the blank hole to be turned inward as shown at *R*, Fig. 3.

The finishing operation on the recess for the lens is unusual, the die employed being shown at *G*, Fig. 4. The shell is placed on the die, the flange formed by the previous die being a loose fit on the reduced portion of the central plug. Downward pressure forces the edge of the shell over the 3-degree tapered end until it hits the radius at the bottom of the taper which forces it outward toward the radius on the locating ring. The locating ring has meanwhile traveled down with the shell. As the edge of the shell is confined, it travels downward, forming the locating seat required for lens *Q*, Fig. 3. At *J*, Fig. 4, is an explanatory diagram showing the position of the ring at the beginning and end of the forming movement of die *G*. The central plug and locating ring are hardened tool steel, while the punch is left soft, as it is not subject to wear.

The shell with the completed recess and lens *Q* in place is shown at *M*, Fig. 3. The die with the locating ring removed to show the shoulders on the plug and ring is shown in Fig. 5.

Various operations are required to complete the shell, an eyelet being drawn from the shell itself for fastening the swivel, and another for clinching the socket to the rear of the shell, while still another is produced for the pull-chain.

An interesting die is used for assembling the bull's-eye glass in the front of the lamp. Provision

had to be made for possible variation in the thickness of the glass. As the assembling operation was to be performed in a foot-press, the possible difference in the pressure exerted also had to be taken into account.

These handicaps were overcome by the simple expedient of placing a soft rubber washer under the locating plug in the die. The cushioning effect of the rubber washer eliminated trouble from broken lenses. Three hardened drill-rod punches "nip" or turn the edges of the shell over the lens, as shown at *S*, Fig. 3, effectively securing the lens in the shell. This operation is performed after the shell has been enameled. The percentage if chipped lenses is so small that it can be disregarded. The die used for this operation is shown at *H*, Fig. 4.

Unsafe Practices that are Still Found in Our Shops

By ARTHUR K. BAKER

WHILE much has been done within recent years to prevent industrial accidents, and the industries now account for a smaller proportion of accidents than those met with in other walks of life, it is a fact that certain shops which claim to have the approval of the state inspector on his last visit are still consistent violators of some of the most elementary rules of safety. In the following, the writer mentions a few of the unsafe practices that he has observed within the last six months in industrial plants.

First, there are unguarded belts and gears, the worst case of which was found in a press room where anyone walking behind the double row of presses was in danger of being scalped by low belts.

Second in importance is faulty electrical work and defective electrical tools, which are likely to give the user a bad shock if he makes contact with any grounded conductor. In this connection, the attitude of electricians and building superintendents was found to be especially dangerous, this attitude being summed up by: "Oh, turn the plug over in the socket and it will be okay." This faulty electrical equipment was found particularly on such machines as floor sanders, electric drills, hand grinders, trouble lights, and bench and machine lights. In one instance, there was a disconnected 220-volt three-phase circuit with the live ends left without even tape on them for months, and this in a narrow aisle and in a very damp basement.

In many cases, wrenches have been used as hammers until they do not fit a standard bolt-head properly. The wrench slips off the bolt-head, sometimes with injury to the knuckles.

A press-room safety device that sometimes causes injuries is the wrist-breaking type of press guard which starts after the press is tripped. It might save a finger, but somehow it seems to me that it is more apt to break an arm.

Then there are those thoughtless workers who leave short round bars about the power hacksaw for others to step on. Right in back of the particular hacksaw where this was seen was a toolroom supply rack, on the top rack of which (about eye level) was stored a collection of small bars, poorly arranged, with many of the ends sticking out just right to catch an eye, or at least take the skin off somebody's cheek or forehead. In many shops, one sees spot-welding done—with plenty of sparks, but no goggles. Grinding operations are performed in the same manner.

In another place, there was a screw press with a long iron bar used as a handle. This was often left in place, overhanging an aisle at head level; it provided a very nice thing to run into. In the same shop, there was a room full of automatic screw machines, with a floor so oily that you could have played shuffle board with the machines. There were also a couple of machines having spindle speeds of about 7000 R.P.M. with unguarded belts. The operator would warn you to keep at a safe distance from the belts, because "the . . . belt has been out in the alley twice this morning."

In another place, the writer ran across cleaning tanks with modern degreasing solvents, but mighty poor light and ventilation. The workmen complained of headaches. There are also plating rooms with little or no ventilation over the acid tanks. The spray room with down-draft ventilation instead of "out the back" is also objectionable. Holes and defective flooring are being fixed up in the front office, but there are even more dangerous ones out in the factory.

Those decrepit old wooden trays with nails sticking out, handles broken off, and bottoms that fall out if the tray is very heavily loaded are another source of accidents.

The most unsafe condition of all is that firm belief on the part of those in authority (even in some of the most unsafe plants) that their shops are very safe and that they have done everything that can be done to make them safe. They will even quote long-time records with no lost-time accidents. It really is lucky that they have been able to secure such careful workers; but some time they may hire a new man, or an old-timer may become careless, and then that fine record will be lost.

* * *

The pneumatic tire, according to *The Inventor*, was developed by Thompson in 1845.

New Process for Producing Corrosion-Resistant Sheet Steel

FOR some time, there has been a need for a material that would serve a similar purpose to galvanized plate and tin plate, but would be free from some of the limitations of these time-tried materials. Solid stainless sheets cost too much for most applications to be substituted for tin plate and galvanized plate. To meet this need, a new process has recently been developed by Robert E. Kinkead, consulting welding engineer of Cleveland, Ohio, known as the carbon arc welding process for making composite metals.

At the outset it might be well to emphasize that this is not a so-called "cladding" process. Furthermore, while plates with from 10 to 20 per cent coating of corrosion-resistant alloy could be made with this process, it is primarily intended for use in connection with thin coatings, where galvanized and tin plate now find application.

"Cladding" involves the welding of one kind of metal to another, as in the case of nickel-clad steel. In the process here described, the corrosion-resistant element is fused to the surface of the basic steel plate, adding as much of the alloying element as may seem desirable.

There are three main problems to be solved in developing a sheet steel with one or both surfaces composed of stainless steel. First, a perfect bond must be obtained between the carbon steel and the stainless steel; second, it must be possible to manufacture the product at a low cost to permit wide distribution; and, third, the product must be made in such a way as to permit the use of existing equipment to the greatest possible extent.

The newly developed carbon arc welding process of making composite metals meets these three requirements. The alloying elements, such as ferro-chrome or nickel, are merely fused to low-carbon steel. The two metals are not welded together in the ordinary sense. The operation consists of making an alloy on the surface of the ingot or slab. In this way, a perfect bond is assured.

To alloy the outside of an ingot so as to produce a 17 per cent chromium surface requires the use of ferro-chrome, furnace slag, and the heat of the electric arc. If 10 pounds of 17 per cent chromium are to be produced on the surface of a ton of steel, the chromium will cost about 60 cents, and the electrical energy consumed will be about 15 kilowatt-hours. The result will be a regular 17 per cent chromium alloy, with all its desirable properties, perfectly bonded to the surface of the carbon steel. Similarly, the 18 per cent chromium, 8 per cent nickel stainless steel composition can be used with equally satisfactory results.

The special equipment required in the production of these alloy-surface sheets is simply the processing equipment for producing the alloy on the surface, and such acid and annealing equipment as would not have to be used for ordinary carbon-steel sheets.

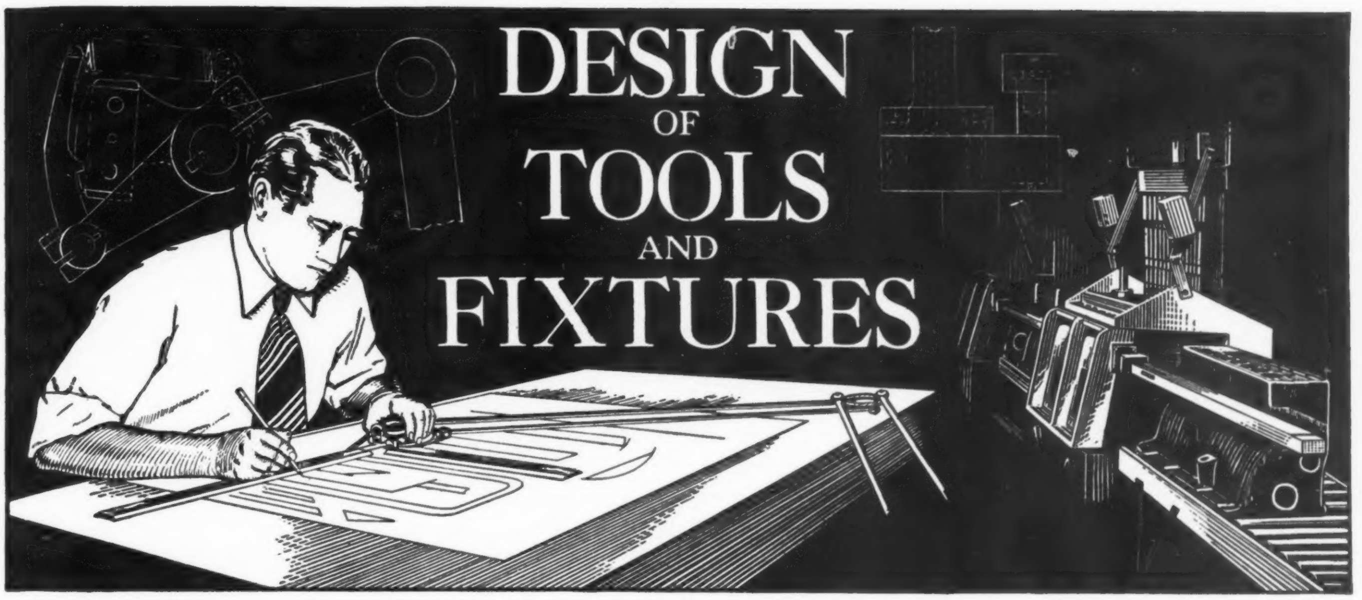
The process is by no means limited to producing a stainless-steel surface on carbon-steel sheets. Steel rails for railroads present another possibility for the use of the process. The wear of rails on curves requires a much harder material on the inside of the rail head than on the outer rail, because of excessive wear. In the steel-making process, it is comparatively easy to apply this alloying method to making any part of the rail both hard and tough.

The speed with which the surface can be alloyed appears to be limited only by the amount of heat that can be applied to the metal. Present experience indicates that a 2 per cent depth of alloy on each of the two sides of an ingot can be applied at the rate of a ton of the composite metal every sixteen minutes with one machine.

Among the many advantages of the new material produced by this process may be mentioned, first, the fact that the alloy surface has a high melting point, which is not true of sheets coated with lead alloys, zinc, or tin. Spot-welding of material with a stainless-alloy surface is feasible, and, under certain circumstances, roller seam welding. The stainless alloy can be soldered, although some modification of the soldering process may be necessary to carry out the operation at the speed required by an automatic can-making machine, for example.

The character of the alloy on the surface would depend to some extent on how the material is to be fabricated. A composite metal with a low-carbon steel base and an 18 per cent chromium, 8 per cent nickel stainless-steel surface may be fabricated by deep drawing operations. When the material is not to be subjected to severe deformation, it appears that the 17 per cent chromium alloy would be more desirable from the cost point of view. For such applications as air-conditioning ducts, panels for housing construction, culverts, roofing, etc., the 17 per cent chromium-alloy surface would seem to be the logical choice.

The United Engineering & Foundry Co., Pittsburgh, Pa., has been granted an exlusive license to manufacture the machinery and equipment necessary to produce this composite metal. The Carnegie-Illinois Steel Corporation has been granted a non-exclusive license to produce the product, and negotiations are in progress with other companies.



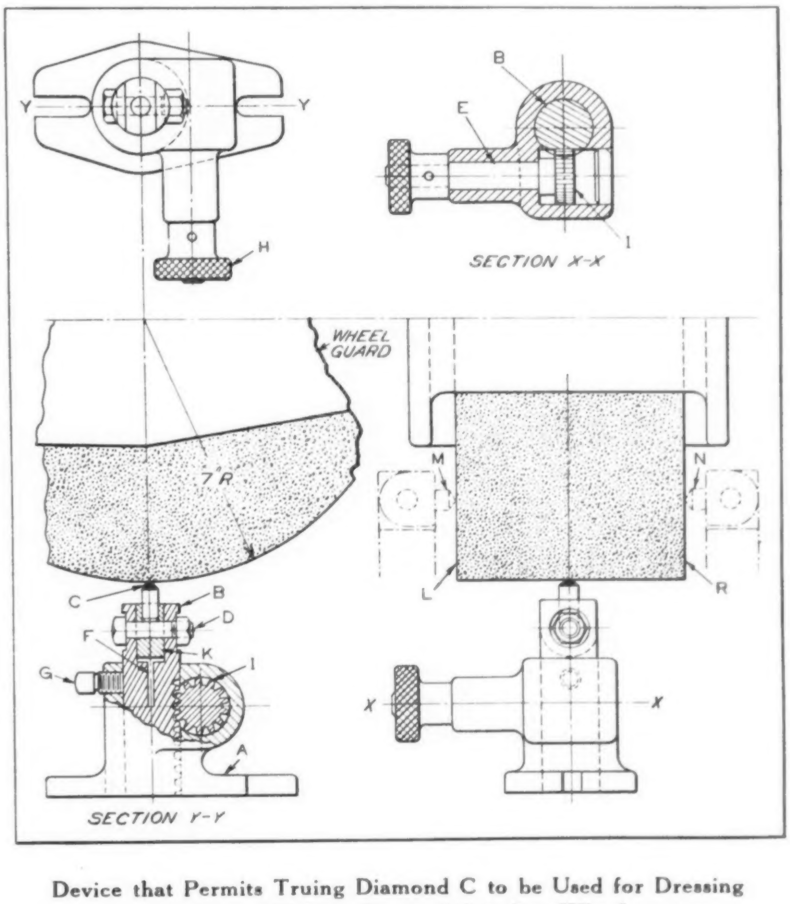
Wheel-Truing Device for Surface Grinding Machines

By J. R. WHITTLES, Holden, Mass.

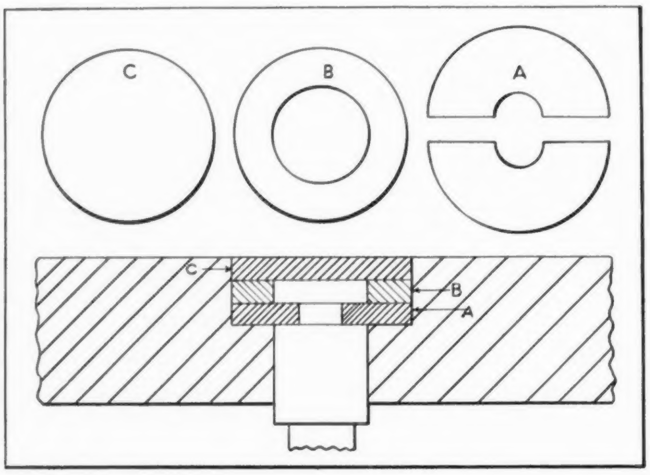
A truing device designed to be mounted at the end of a surface grinder table or on the top of a magnetic chuck is shown in the accompanying illustration. This device is adjustable for height and has a swivel joint that permits the truing diamond to be rotated 90 degrees in either direction for truing the sides of the grinding wheel, as indicated at *M* and *N*. When the diamond is in position for truing the face of the grinding wheel, it is only necessary to feed the wheel down to take the proper depth of cut each time the diamond passes the face of the wheel.

The down feed is accomplished by using the micrometer feed of the grinding machine. The traversing mechanism is used in truing the face of the wheel. Side *L* of the grinding wheel is trued by setting or swinging the diamond 90 degrees to the right, as shown at *M*. The truing diamond is then fed up or down by turning the knurled knob *H* very slowly with the thumb and fingers. The opposite side *R* of the wheel is trued by swinging the diamond 180 degrees to the left position, as shown at *N*.

Body *A* of the fixture has a slot at each end of the base for fastening the device to the grinder table. The base is also bored to fit the diamond-holder *B* and the shaft *E*. The holder *B* is machined to fit swivel-block *K* and has a saw slot *F* in it which allows the swivel-block to be clamped securely by means of bolt *D*. On the side of the holder is a rack that meshes with spur gear *I*. Bolt *D* is also used as a swivel-pin for block *K*. Shaft *E* has a spur gear at *I* and a shoulder at the other end on which is fitted the knob *H*. Set-screw *G* locks the diamond-holder in position for truing the grinding-wheel face, and is not used when truing the sides of the wheel.



Device that Permits Truing Diamond C to be Used for Dressing Sides, as Well as Face, of Grinding Wheel



Diagrammatic Sketch of Punch-holder Consisting of Three Simple Parts A, B, and C, the Hardened Disk C being Used Only for Heavy Stock

Holding Small Punches in Punch Pad

By DONALD A. BAKER, Hartford, Conn.

The method of holding small punches in a punch pad shown in the accompanying diagrammatic sketch is one of the best the writer has ever seen, from the standpoint of efficiency, ease of application, and standardization.

The punch is held in the punch-holder pad by a hardened split washer *A;* a soft washer *B* is used to give the punch additional support, and a hardened disk *C* serves to take the thrust on the punch. All three pieces *A, B,* and *C* are made the same thickness. For ordinary work which can be stripped from the punches without too much strain, a thickness of 1/16 inch is sufficient for these pieces. In actual practice, the neck or groove in the punch need be only 1/32 to 1/16 inch deep, and there should be a radius fillet instead of a square shoulder where the body of the punch is reduced in diameter.

The punch is made from a piece of drill rod of the correct body diameter, which is faced square at both ends. A shallow 1/16-inch groove is then cut 1/16 inch from one end, and the other end is turned and polished to the size of the hole to be punched. The punch is next hardened and drawn, after which it is ready for assembly. Close fitting punches, however, may require the grinding of both the body and the working end of the punch after hardening.

After the punch is completed, the hole in the punch pad is bored and reamed to the correct size for a light drive fit and the back side of the pad is counterbored to the correct depth for either two or three washers, as required, the counterbore being 1/8 inch deep when only washers *A* and *B* are used, and 3/16 inch deep when the hardened disk *C* is added.

In assembling, the punch is inserted in the hole from the rear of the pad, the hardened split washer being placed around the groove in the shank, and the punch then driven home. Washer *B* is next put in place. If the work is very heavy, so that there is a tendency for the punch to be driven back into the cast-iron punch-holder to which the punch pad is attached, it is good practice to use a hardened disk *C,* as shown. Care must be taken to see that the holes for the washers and disk are counterbored to the correct depth and that the heads of the punches are machined to the correct dimensions, so that all parts will be flush at the back of the punch pad.

When the die is in operation, the washer *A* serves to pull the punch out of the work. Washer *B* gives added lateral support to the head and prevents dishing of washer *A* when the stripping action is very severe. Disk *C* acts as a hardened backing plate to prevent the punch head from being driven back into the softer metal of the holder.

One of the advantages of the assembling washers is that they can be made up in quantities and kept in stock ready for use, only a very few sizes being necessary for a wide range of punch sizes. Their use also eliminates the necessity for employing the larger stock required for punches of the type made with heads.

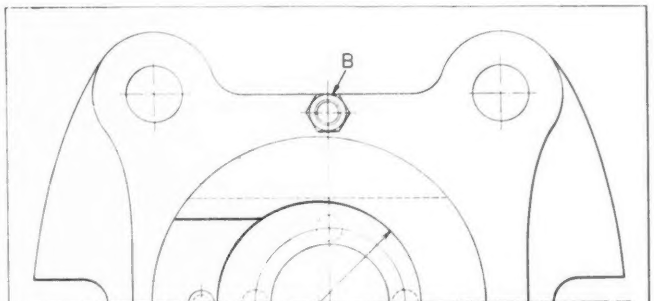


Fig. 2. Die for Blanking and Cupping Shell for Radiator Inlet Pipe

Dies for Producing Radiator Inlet Pipe with Angular Flange

By HORACE R. WENTZELL, Chief Engineer
Adams E.D.T. Inc., South Bend, Ind.

The radiator inlet pipe shown in Fig. 1 is made from 18-gage sheet brass, dies being employed to perform the blanking, drawing, forming, and piercing operations. These dies, shown in Figs. 2 to 6 inclusive, have been designed to permit the work to be handled with a minimum number of operations, in order to keep the production cost as low as possible.

The blanking and cupping are done in the conventional compound die shown in Fig. 2. The cup is drawn off center, so as to allow sufficient metal on one side for drawing out the long side of the pipe. The left-hand side of the stripper is cut away, as shown at *A*, to allow the formed cup to be carried out of the die with the scrap. The drawing pressure exerted on the draw-ring is furnished by a spring pad acting against pins that pass through holes in the bolster plate.

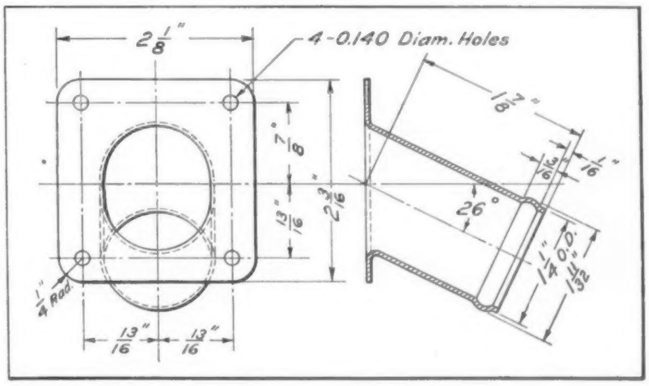


Fig. 1. Details of Radiator Inlet Pipe Made from 18-gage Sheet Brass

The two reducing operations are performed in the simple dies shown in Figs. 3 and 4. It is essential that all three of the drawing operations be held to a definite depth, in order to have the proper amount of stock for the final drawing operation. This is accomplished by having adjustable positive stops incorporated in the three dies, as shown at *B*

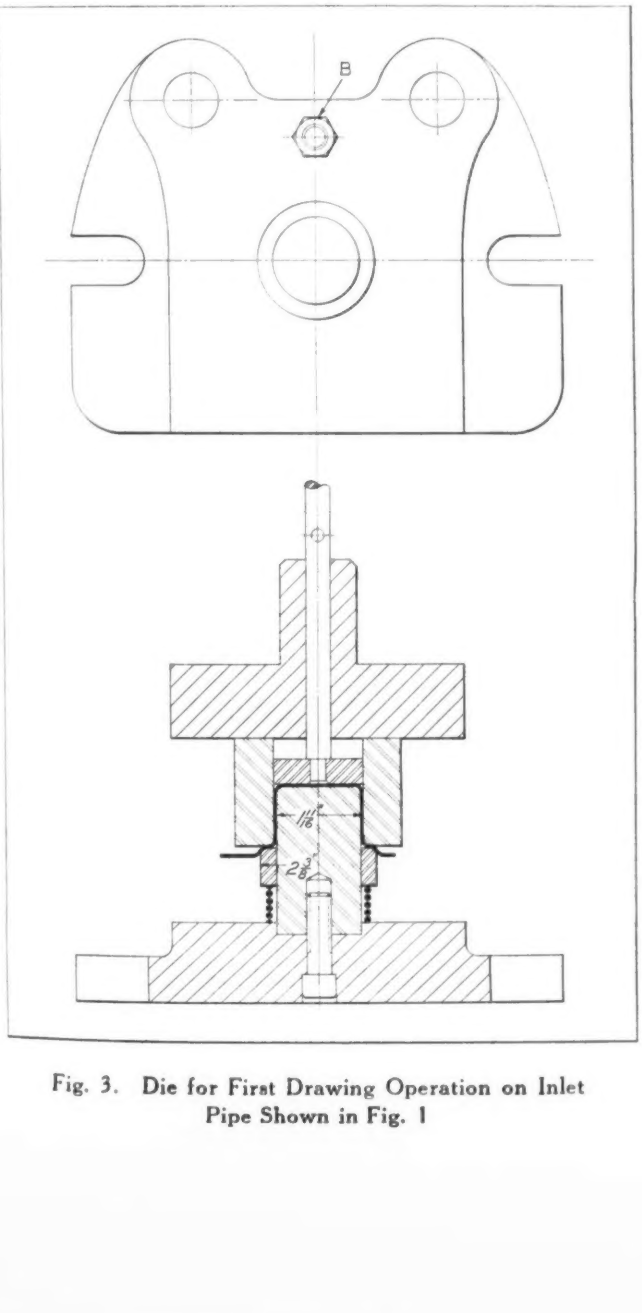


Fig. 3. Die for First Drawing Operation on Inlet Pipe Shown in Fig. 1

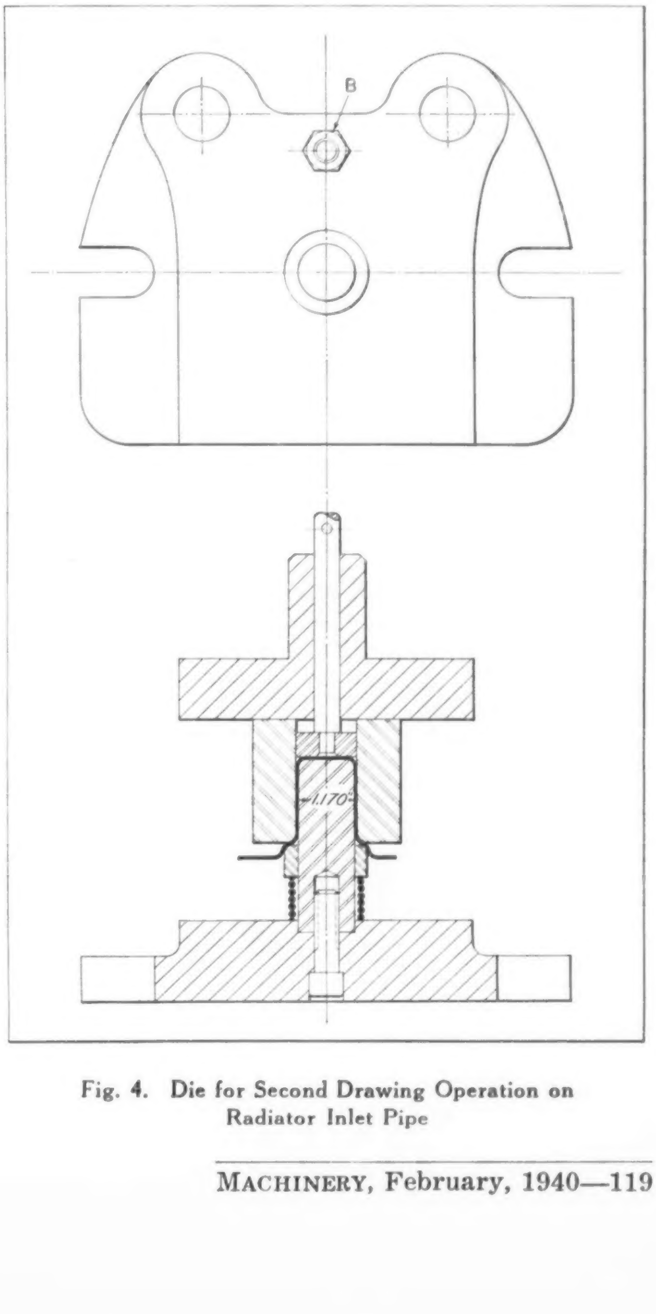


Fig. 4. Die for Second Drawing Operation on Radiator Inlet Pipe

in Figs. 2, 3, and 4. The pipe is drawn to the finished diameter in the die shown in Fig. 4.

The final drawing operation is performed in the die shown in Fig. 5, which finishes the pipe to its full depth, pierces or blanks out the end, and flattens the flange to the proper angle. This die presented several problems, as it was necessary to draw the pipe to the full depth, flatten out the flange to the required angle, and then strip the work off the punch. This was accomplished by making an inverted stripper *C*, with the steel flattening plate mounted on the stripper plate and piloted by punch *D*.

The stripper required an extra amount of travel, in order to permit the pipe to be removed from the die. A notch, as shown at *E*, was provided in the die to allow the operator to pick up the piece with a pair of tongs. The blanking die, as shown at *F*, was made as a separate piece to permit it to be sharpened.

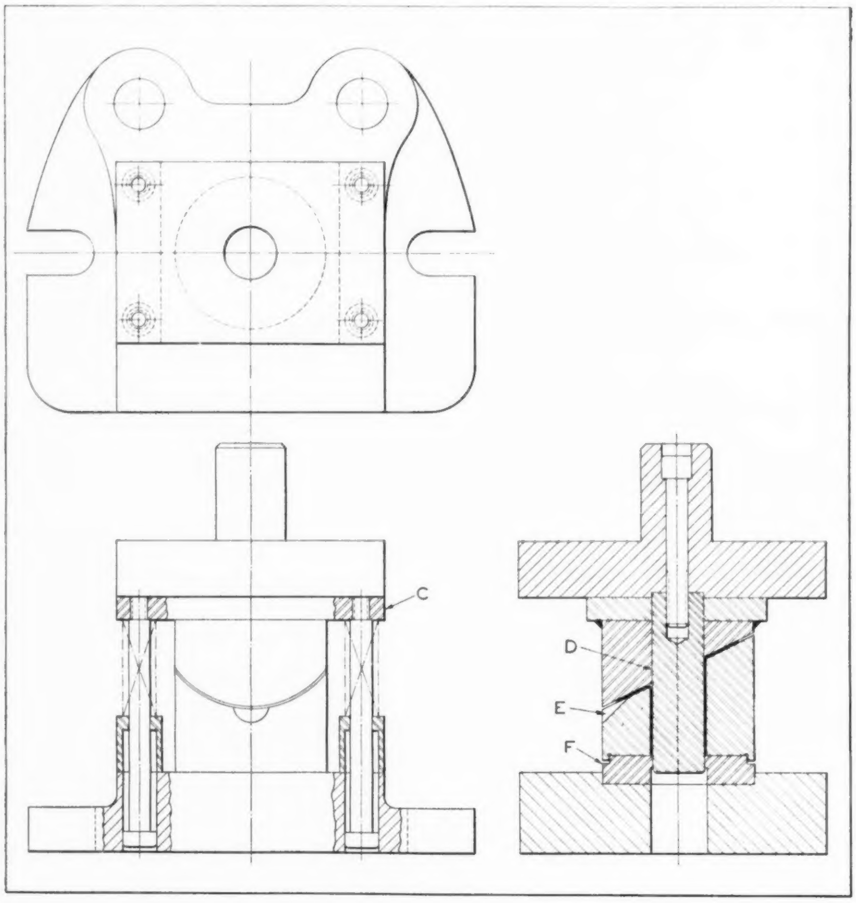
The flange of the work was trimmed and the four rivet holes pierced by the die shown in Fig. 6. The opening in this die for receiving the pipe extends downward and toward the rear of the press. The die opening, being inclined in this direction, makes it much easier for the operator to insert and remove the work. A wire hook is provided to permit the operator to remove the work from the die without placing his hands in the danger zone. Two V-shaped scrap cutters *G* are placed at the corners of the trimming die to cut the scrap into pieces so that it will fall toward the sides of the die.

The final operation of rolling the bead for the hose clamp is performed on a standard bead-rolling machine.

* * *

Encouraging Clean Shop Departments by Good-Natured Chiding

An amusing yet effective method of promoting safety and efficiency through plant cleanliness has been developed by Joseph T. Ryerson & Son, Inc., at its various plants. The plant inspection committee of the Buffalo, N. Y., steel service plant of the organization conceived of the idea of cutting out from rolled-steel plate and painting in bizarre colors an unkempt gentleman known as "Sloppy Sam." Sam is given lodging in departments considered sub-standard by the committee during its weekly inspection tours. His presence evokes good-natured chiding from members of other departments, who, in turn, make a definite effort to keep their part of the shop clean, so that the unwelcome visitor will have no reason to call on them. The results of this humorous approach to the shop cleanliness problem have been so favorable that duplicates of Sam have been made for the company's other plants.



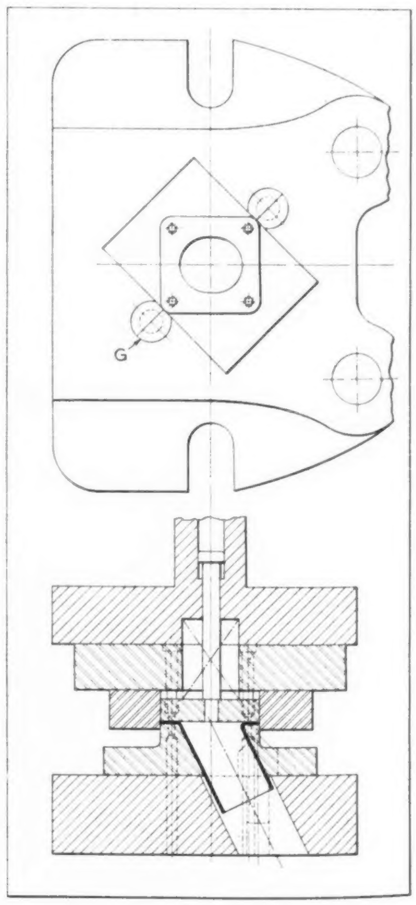


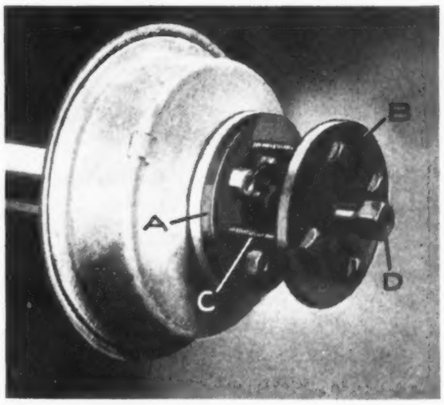
Fig. 5. (Left) Die for Final Forming and Angular Flanging Operations on Pipe Shown in Fig. 1. Fig. 6. (Right) Die for Piercing Four Holes in Flange of Radiator Inlet Pipe and Trimming Flange to Shape Shown in Fig. 1

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

Shop-Fabricated Wheel-Puller

The wheel-puller here illustrated was made for removing the rear wheels from an automobile, as the regular shop gear-pullers could not be attached to the studs in the drum without using a special jig. The two disks *A* and *B* were flame-cut from 1/2-inch steel plate. The hub plate *A* is 6 inches in diameter, and has a hole 2 1/4 inches in diameter through the center. It has two sets of holes in it, spaced 45 degrees apart on a 4-inch bolt circle. One set of holes was drilled to a diameter of 9/16 inch and countersunk to fit the studs in the wheel drum. The other set was tapped for 1/2-inch machine bolts.



Wheel-puller Used for Removing Rear Wheels from Automobiles

The screw plate *B* is 6 inches in diameter and has a central hole 1 1/4 inches in diameter through it. There are also four holes 9/16 inch in diameter, spaced 90 degrees apart. A 1-inch hexagonal nut is centered over the 1 1/4-inch hole in plate *B* and welded in place. The entire unit was assembled as shown in the illustration, using four 1/2-inch machine bolts *C* to fasten the two plates together and a 1-inch cap-screw *D* for the pressure screw. This unit can be constructed from material available in almost any shop, the one shown being fabricated in about 1 1/2 hours. A wheel-puller of this type has ample strength. Three pullers of similar design to the one described have been built for various applications.

K. N. BANTHIN
Oak Park, Ill.

Is Belt Slip Worth Talking About?

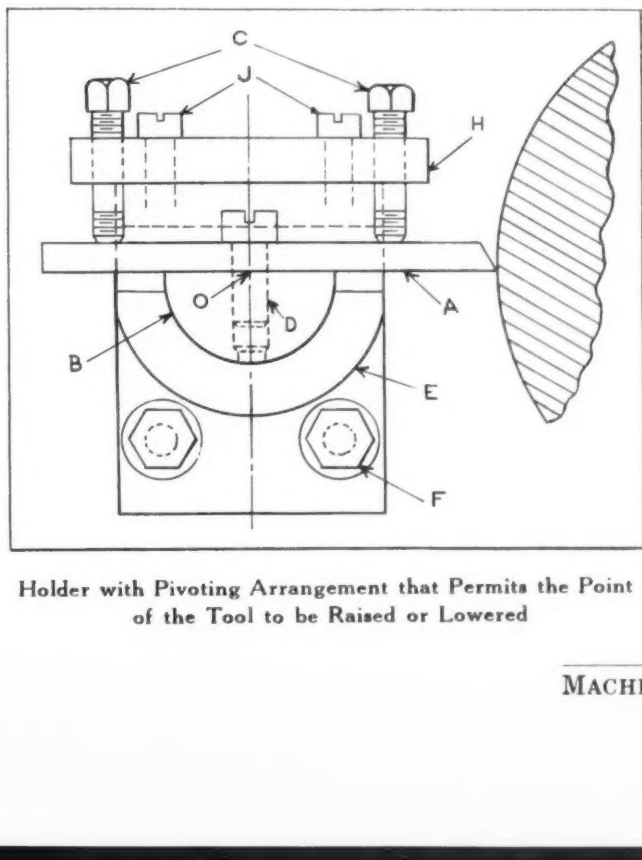
The matter of belt slip is much more important than many executives realize. The writer has before him a report concerning a large plant that is saving $1656 a year per drive, after making an apparently simple change from one type of belt drive to another. The new drive, according to the report, saves 23 cents an hour, and since the belt runs twenty-four hours a day, 300 days a year, the annual saving per drive is $1656.

Another report relates to four belts in a large plant. By installing a suitable type of belt, $52 a day was saved on the four belts. According to the company's records, the belts formerly used lasted only three days. The new belts lasted five times as long, saving $783 for the four belts. While rapid belt wear is not always attributable to slippage, that is the primary cause of all belt wear.

Newark, N. J. W. F. SCHAPHORST

Holder that Permits Tool to be Pivoted

An arrangement for mounting a cutting tool, glue scraper, or similar part in such a manner that it can be pivoted to raise or lower the point, is shown in the accompanying illustration. The cutting tool *A* is held in place on the bar *B* by means of the screw *D*. Bar *B* is mounted so that it can revolve about point *O* in the bracket *E*, which, in turn, is clamped in place on the machine by the screws *F*. There are two adjusting screws *C* in plate *H*, which is attached by means of the screws *J* to bracket *E*. The two screws *C* are used to clamp and to raise or lower the cutting tool *A*.



Holder with Pivoting Arrangement that Permits the Point of the Tool to be Raised or Lowered

FRANK HARTLEY

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

C. C. A.—What are the accepted figures for the weight of different kinds of belting, in pounds per cubic inch?

Answered by W. F. Schaphorst, Newark, N. J.

There is comparatively little information on the weight of belting. Few handbooks and catalogues contain this information. In one book that I came across I found the following:

Type of Belt	Weight, in Pounds per Cubic Inch
Oak-tanned leather	0.035
Cotton and canvas	0.026–0.050
Rubber	0.045

In computations that I have made, I find that hair belting weighs approximately 0.035 pound per cubic inch, and high-grade mineral-tanned leather belting about 0.030 pound per cubic inch.

In Bulletin No. 41 of the Ohio Engineering Experiment Station, "Transmissive Power and Stretch of Belting," by Professors C. A. Norman and G. N. Moffat, the following data are given:

Kind of Belt	Weight, in Pounds per Foot, 3 Inches Wide
Rubber No. 1	0.266
Balata	0.268
Stitched canvas	0.360
Oak-tanned leather	0.209
Mineral-tanned leather	0.162
Hair	0.314
Solid cotton	0.199
V-belt, rubberized	0.196

It is of interest to note that the mineral-tanned leather belt, which is the lightest of all, proved, in tests, to out-pull all the others. Copies of the bulletin referred to can be obtained from the Engineering Experiment Station, Ohio State University, Columbus, Ohio.

Union Responsibility for Contracts

H. S.—Are union employes bound to fulfill contracts made with their employers? Will the higher courts uphold the validity of such contracts?

Answered by Leo T. Parker, Attorney-at-Law Cincinnati, Ohio

Contrary to the opinion of many, contracts are valid and enforceable, by the terms of which employes agree not to divert, solicit, or otherwise interfere with their employer's customers. In fact, according to a higher court decision, it was held that a contract was effective to prevent striking employes from picketing their employer's business after signing a contract agreeing not to attempt to divert the employer's customers.

In the case of Perfect v. Marsh [191 Atl. 774], each employe of the company "signed up" for a year. The contract provided for loyal and exclusive service during the period of employment; it stipulated further that the employe would not do anything to divert or take away his employer's customers within one year after the termination of his employment.

The employes went on strike and soon began to picket the plant. They carried placards requesting customers not to trade with the company because the men were on strike. The company filed suit and asked the Court to grant an injunction to prevent the employes from picketing, contending that the employes had broken their employment contract in which they had agreed not to attempt to divert customers.

The higher Court granted the injunction and said: "We see no ambiguity in a clause which provides that the employe shall not for a year after termination of his employment in any way attempt to divert or take away customers, etc. If this does not cover the case of a striking employe who has broken his contract by . . . attempting to induce regular customers to cease their patronage, then language has no meaning."

* * *

Research in Powder Metallurgy

A modern laboratory of powder metallurgy is being opened at the Stevens Institute of Technology, Hoboken, N. J. This laboratory is installed through the cooperation of several American industrial organizations who are regularly using processes involving powder metallurgy in their work. The laboratory will serve as a training school to provide industry with competent research workers in this field. It will also serve as a clearing house to which American industry can bring its research and development problems in the powder metallurgy field. Gregory J. Comstock, associate professor of metallurgy, and Dr. Claire C. Balke, assistant professor of metallurgy, will direct the activities of the laboratory. Professor Comstock is a pioneer in the development of powder metallurgy, and well known in this field.

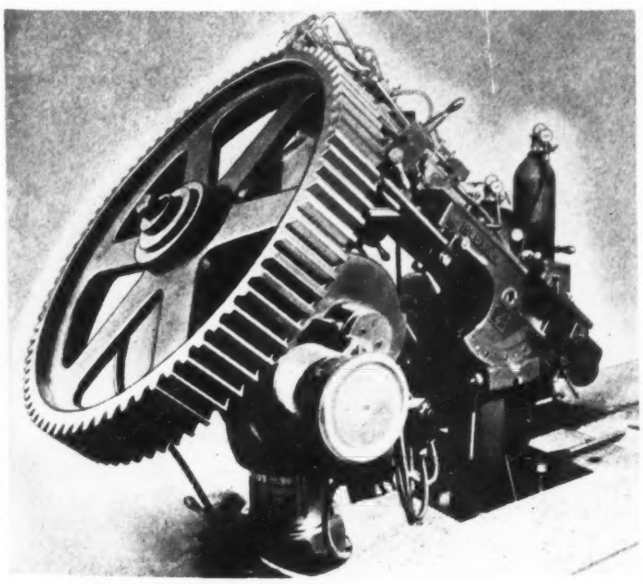
Flame-Hardening of Gear Teeth

Essential Facts Relating to the Application of the Flame-Hardening Method to Gears

By DWIGHT VANDEVATE
Assistant Works Manager
Gleason Works, Rochester, N. Y.

THE problem of heat-treating large sizes of bevel gears has had the attention of the Gleason Works for many years. As early as 1923, the company built a quenching press capable of handling gears up to 60 inches pitch diameter. This press performed the work for which it was designed successfully, but the cost of operation limited its use. Gears between 25 and 60 inches pitch diameter are usually made in comparatively small quantities, and the cost of heating large gears in a gas furnace, together with the cost of the dies, presented serious limitations. Furthermore, the press could be applied only to gears of fairly simple ring design.

In 1933, the Gleason Works began to apply the flame-hardening process to gears. After considerable experimentation, the present design of hardening machine was adopted. One important feature of the Gleason process is the hardening of both sides of a tooth at the same time. In some of the earlier methods, only one side of a tooth was hardened at one time. This caused unequal stresses in the tooth, resulting in distortion. Furthermore, the temper on the first side was often slightly drawn when the second side was heated for hardening. These difficulties are eliminated when both sides of the teeth are hardened at once.



Gleason Surface-hardening Machine Set up for Hardening the Teeth of a Large Spur Gear

The development of the flame-hardening machine for gear teeth has resulted in a rapid broadening of the field for hardened bevel gears. At present, flame-hardened gears are used in paper-mill machinery, coal pulverizers, oil-well drilling and pumping equipment, steel-mill machinery, boring-mill table drives, locomotive drives, precision machine tool drives, and many other applications, including both heavy-duty drives and drives where extreme precision of motion is essential, and, in many cases, drives meeting both of these requirements. Bevel gears with complicated hub designs and heavily ribbed sections are no longer a problem in hardening, since the teeth can be surface-hardened by the Gleason process at low cost and without change or distortion.

Some flame-hardening of gear teeth has been done by hand; but since this method is dependent upon human judgment, there is danger of overheating, cracking, and non-uniform hardness. Gas-cutting equipment of the standardized types has a limited application in gear hardening, since this equipment provides a mechanical means for controlling the speed of the burners over the tooth surface. It is applicable, however, only to a few types and sizes of gears.

Principles of Flame-Hardening Process

In the flame-hardening of gear teeth, the oxy-acetylene flame serves only as a heating medium, no change taking place in the chemical composition of the material being hardened. The process differs fundamentally in this respect from casehard-

ening or nitriding. The steel is simply heated with the oxy-acetylene flame to a temperature at which subsequent quenching, usually with water or air, will increase the surface hardness. In this quenching, there is not only heat radiation from the surface to the quenching medium, but also a rapid heat transfer from the surface to the cold mass of metal underneath.

The best explanation of the relatively slight distortion and high wear resistance obtained by this method is that the surface-hardening of nickel-molybdenum oil-hardening steel (or manganese-molybdenum steel, in steel castings) produces an austenitic structure at and near the surface. This structure undergoes a comparatively slight change in volume during the transformation, as compared with the martensitic structure, and hence causes relatively little stress.

The subsequent operation of the gear under load results in the cold working of a thin outer layer of austenite, changing it to martensite, with consequent increase in wear resistance. There is a gradual transition in hardness from the extremely hard surface to the heat-treated core.

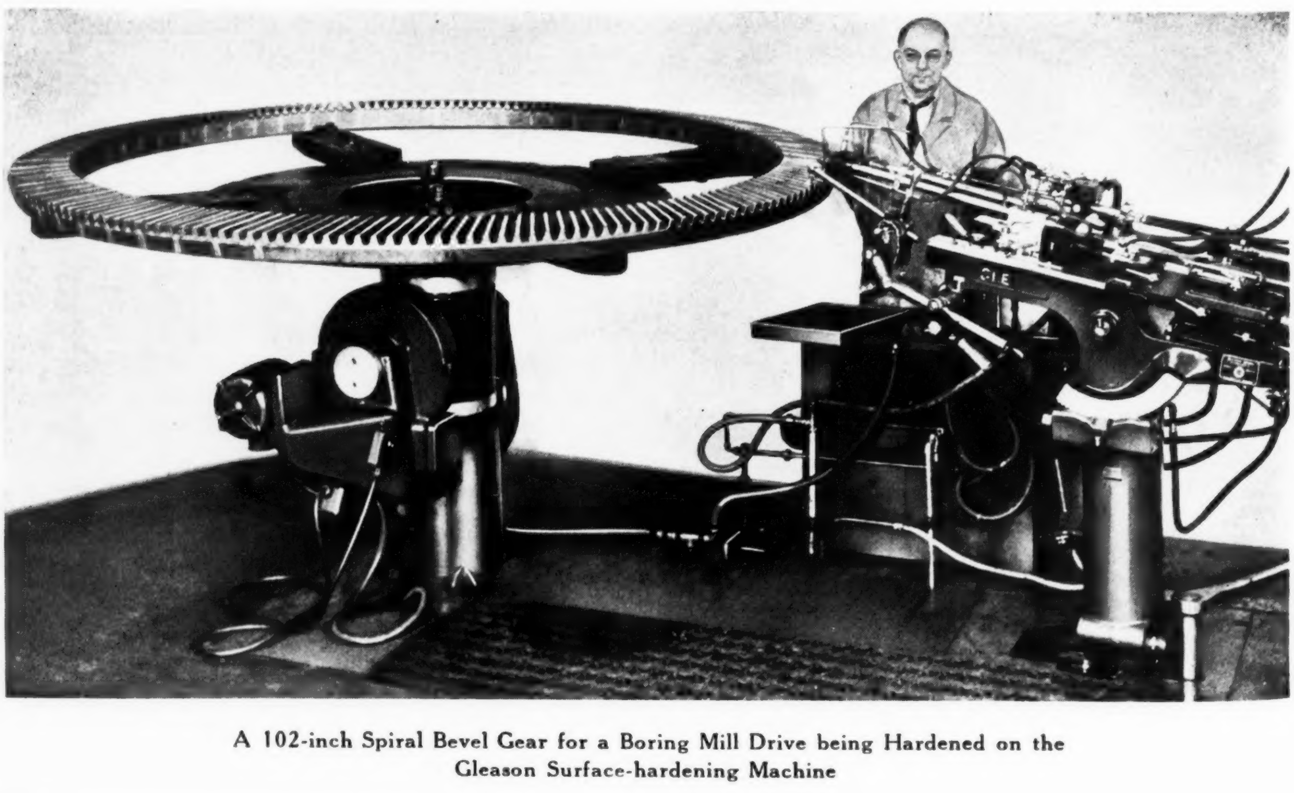
The process imparts to the steel a high surface hardness and a wear resistance comparable to that produced by casehardening, while the toughness of a quenched and drawn core is retained. Distortion and residual heat-treating stresses are reduced to a minimum. For example, a spiral bevel ring gear of 36 inches pitch diameter was checked for flatness with a 0.001-inch thickness gage. This gear was flat to this limit both before and after the surface-hardening operation.

The quality of resistance to wear is noticeable when flame-hardened spiral bevel or hypoid gears are lapped. This wear-resisting quality has been noted on flame-hardened gears, even after long service. In one case, a heavy-duty pair of spiral bevel gears was inspected after two years of service in a dredge. No signs of wear were apparent. This particular pair of gears has now been in satisfactory service for about four years.

A point important to note is that there is no change in the chemical composition, nor is there any abrupt change in micro-structure, with a sharp line of demarcation between the hardened zone and the core, as is often found in casehardened products. Because there is no change in the core, and, therefore, no metallurgical transformation with an accompanying volume change, the stresses between the hard surface and the relatively ductile core are low, eliminating any tendency of the case to pull away from the core when the load is applied to the gear teeth in service.

In the Gleason flame-hardening practice, the tooth is hardened to a considerably greater depth than in the usual casehardening practice. The hardened area extends completely across the top of the tooth, thereby providing a backing to the hardened surfaces at the top edges of the tooth. The root, where the greatest stress concentration occurs, although unaffected by the flame-hardening operation, has the advantage of great strength and shock resistance imparted to it by the preliminary heat-treatment.

The hardening operation, as carried out in the Gleason machine, is automatic; it is only necessary for the operator to index the gear from tooth to tooth. The machine is universal, being applicable to straight bevel, spiral bevel, hypoid, spur, helical, and internal gears.



A 102-inch Spiral Bevel Gear for a Boring Mill Drive being Hardened on the Gleason Surface-hardening Machine

The selection and preliminary heat-treatment of the materials used for flame-hardened gears are of great importance. These matters have often been overlooked in the manufacture of flame-hardened gears—sometimes with serious results. The following paragraphs outline the recommended Gleason practice.

Steel Forgings Used for Flame-Hardening Gears

While many types of steel forgings can be successfully flame-hardened, S A E 4640 and S A E 6145 are recommended. These steels are usually readily obtainable, comparatively inexpensive, and give uniformly dependable results. A lower-priced steel, S A E X1340, is also rapidly coming into use, especially for some machine tool gears where the tooth loads do not require the maximum possible surface hardness and the sections are light enough to harden and draw to the required core hardness. In specifying S A E X1340, the usual practice is to require that "a 1-inch round section must harden in oil to a minimum hardness of 42 Rockwell C."

Preliminary Heat-Treatment of Steel Forgings

Since flame-hardening has no effect on the core, it is essential that the core strength be obtained before the blanks are machined. The following preliminary heat-treatment is specified: Normalize, reheat, quench, and draw to the required hardness. The required degree of core hardness will vary from 235 to 302 Brinell, according to the stresses to which the gears are subjected in service. In a few cases, where the tooth loads are extremely high, a core hardness of from 302 to 341 Brinell is specified.

The preferred practice is to purchase the forgings in the untreated state, rough-machine them, rough-cut the teeth, heat-treat them to the desired core condition, and then finish-machine them, finish-cut the teeth, and flame-harden them. This procedure, however, is not imperative, since satisfactory results can be obtained through the heat-treatment of the forgings before any machining is done. The preliminary heat-treatment produces the proper Brinell hardness, together with the desired micro-structure.

The maximum resistance to shock is generally obtained by reheating after quenching to about 1200 degrees F., from which temperature, in the case of carbon steel at least, the metal may be again quenched or slowly cooled. This treatment results in a very fine grain.

Selection and Preliminary Heat-Treatment of Steel Castings

For flame-hardened gears, steel castings containing from 1.00 to 1.50 per cent manganese and 0.35 per cent carbon are recommended. It is well to include in the specification the statement: "Analysis should be suitable for flame-hardening." The exact analysis may then be left to the steel foundry. The castings must be given a preliminary heat-treatment, preferably by the foundry, in order to obtain the required core structure.

To assure that the material and heat-treatment are all that is required, a close check-up or testing of both forgings and castings is necessary. It is recommended that the rough forging or casting be tested for hardness, and that the test be repeated after the gear blank has been turned.

The Quenching of Flame-Hardened Gear Teeth

The Gleason machine is arranged for water or air quenching. Adjustments are provided so that the quenching streams can be located as close to, or as far from, the heating points as desired. In flame-hardening S A E 4640 or other oil-hardening steels, however, it is good practice to omit the water quench. Because of the rapid rate of heating and the sharp temperature difference between the surface and the interior of the gear blank, a self-quenching effect is obtained. In order to accelerate this self-quenching effect and to insure uniformity of quenching, it is good practice to harden non-adjacent teeth in succession, and to use a water stream on the gear some distance away from the tooth being hardened. To do this, the index may be set to the lowest number of teeth that will not divide evenly into the total number of teeth in the gear.

To obtain the best results, however, it is recommended by the Gleason Works that a self-quenching steel be used, eliminating entirely the direct water quench. The combination of a properly heat-treated core and self-quenching eliminates the danger of surface cracks and internal stresses, thus making a subsequent drawing operation unnecessary. It has been pointed out that the internal stresses in a piece of steel that has been properly flame-hardened are likely to be less than those found in furnace-hardened steel. The reason for this is that, in flame-hardening, a small band of relatively thin surface is heated above its transformation range and then hardened. It is backed up by the colder part that does not go through the transformation. In hardening in a furnace, however, the whole piece is heated above the critical temperature; and in rapid cooling, the whole piece goes through the transformation progressively, producing expansion and contraction in different parts of the piece at different times.

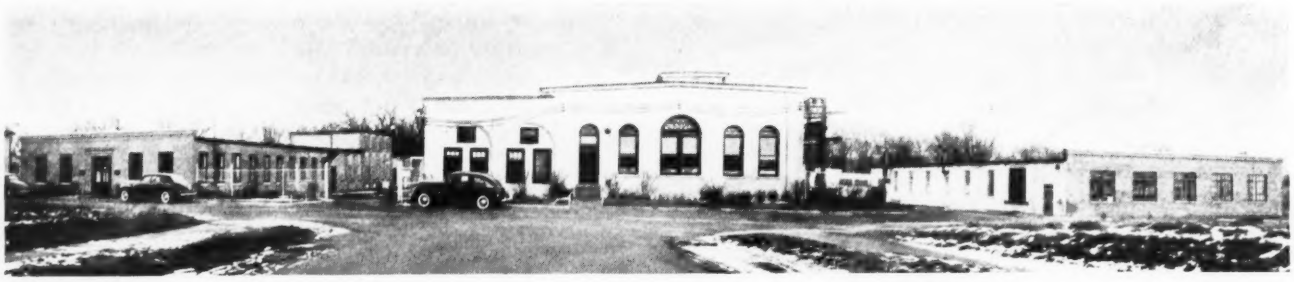
The hardness obtained when the process is properly carried out is about from 55 to 57 Rockwell, or from 550 to 600 Brinell. The penetration is ordinarily about 1/16 inch, but can be varied according to the pitch of the gear teeth.

The flame-hardening process has several definite advantages over casehardening and nitriding. On the larger sizes of gears, the considerations of cost

and freedom from distortion are definitely in favor of flame-hardening. Gears have been successfully hardened up to the maximum limit of the largest available machine—that is, 120 inches pitch diameter and 16 inches face width. A continuously increasing percentage of all spiral bevel and hypoid gears and pinions cut on planing-generating machines have the teeth subsequently flame-hardened. In this field, the flame-hardening process has been demonstrated to be a success.

In the smaller range of gear sizes, the application of the process is growing. At the Gleason Works, gears of 10 diametral pitch are hardened regularly, and on several occasions, gears of finer pitch have been flame-hardened. There is a definite field for flame-hardened gears in machine tool work, where the hardened gears must be made to close limits of concentricity. Some machine tool gears have been made to an eccentricity tolerance of 0.0002 inch.

Hardinge Bros. Celebrate Fiftieth Anniversary



Present Plant of Hardinge Bros., Inc., at Elmira, N. Y.

THIS year, Hardinge Bros., Inc., Elmira, N. Y., for fifty years manufacturers of precision machine tools and collets, celebrate their golden anniversary. It was in 1890 that the two brothers, Henry and Franklin Hardinge, started a small business to manufacture watchmaker's lathes and collets. Their first factory was a tiny building in the rear of a boarding house at 359 W. Monroe St., Chicago, Ill. When the first winter came, the severely cold weather literally drove them out of their inadequate quarters.

The brothers then formed a corporation with Stephen Dale, who gave financial assistance to the growing business. The next factory was located in a room over a stable at 1230 Dunning St. (now Altgeld St.) Chicago. Here the business grew to such an extent that in May, 1892, a small factory was erected at 3135 Lincoln Ave. Two years later, Stephen Dale left Chicago and withdrew from the business. The two brothers conducted the business until 1895, when Henry Hardinge withdrew.

Franklin Hardinge then carried on the business. The watchmaker's line developed into one of precision bench lathes and collets, and the business gradually expanded until, in 1913, the company moved into a modern fireproof structure in Ravenswood. This plant was operated until 1931, when new interests were brought into the company and the business moved into a new modern plant in Elmira, N. Y. At that time, Franklin Hardinge became chairman of the board of directors, and Douglas G. Anderson, president.

In 1937, and again in 1939, additions were made to the company's plant to take care of the rapidly expanding business. In 1938, the Morrison Machine Products, manufacturers of collets, feed-fingers, and ground form tools for all makes of screw machines, was acquired, and is now operated as the Morrison Machine Products Division.

Hardinge Bros. have been pioneers of many new developments in the precision bench lathe and milling machine field. The company's present plant has 50,000 square feet of manufacturing space devoted exclusively to the manufacture of precision machine tools and accessories.

* * *

Inventors to be Honored by National Association of Manufacturers

More than one thousand inventors and research scientists whose achievements within the last twenty-five years have resulted in the creation of new industries and new jobs, as well as new and better products for consumers, have been nominated for the Modern Pioneer Awards, which will be presented by the National Association of Manufacturers, 14 W. 49th St., New York City. The recipients of the Modern Pioneer Awards, which are to be presented some time in February in connection with the observance of the one hundred and fiftieth anniversary of the patent system, are now being selected by a committee of judges. A series of dinners, at which awards will be presented in fifteen industrial centers, will conclude with a national program in New York February 27.

Unique Amplifying Mechanism for Precision Measuring Instrument

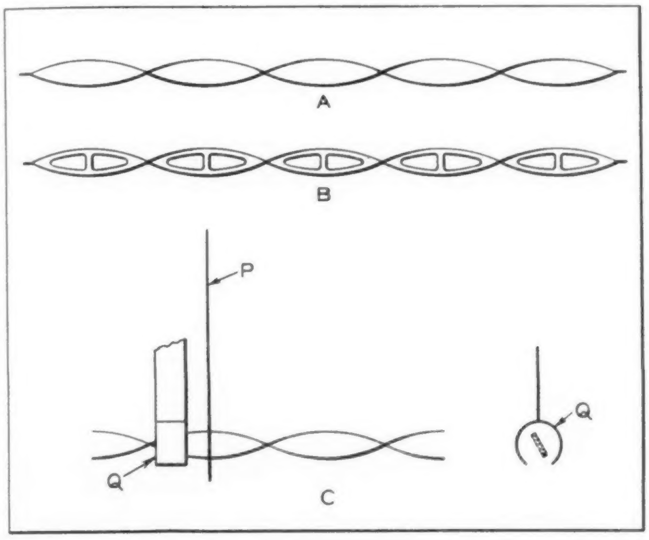


Fig. 1. (A) Metal Strip of Rectangular Cross-section Twisted into a Helix for Use in Amplifying Mechanisms. (B) Strip Similar to One Shown at (A), but Having Perforations Designed to Improve Amplifying Characteristics. (C) Indicating Pointer P Attached to Strip A and Split Tube Q Employed to Hold Drop of Oil Used for Damping Effect

A UNIQUE movement-amplifying mechanism developed to transmit movement from the contact or measuring point to the indicating pointer of precision measuring instruments has, as its most important part, a metal strip of rectangular cross-section which is twisted into a helix, as shown at *A* and *B*, Fig. 1. This twisted part, of unusual design, is employed in instruments for taking precision measurements of length, weight, pressure, electrical energy, etc., which require an amplifying unit that will operate with a minimum of frictional and energy loss and without back pressure.

The mechanism described and illustrated in this article is protected by patents of Aktiebolaget C. E. Johansson, of Eskilstuna, Sweden. It is being employed in extensometers, electro-cardiographs, micro-monometers, variometers, and surface finish testing instruments, as well as in the "Mikrokator" described in June, 1939, MACHINERY, page 729, as a recent addition to the line of instruments sold by the Swedish Gage Co. of America, Detroit, Mich. The following description is based on information prepared by H. Abramson.

The metal strip *A*, Fig. 1, is twisted into the required helical form by fastening each end rigidly and winding from the center. The winding operation is continued until the metal has been formed sufficiently to retain the helical shape permanently. When the strip twisted in this manner is held at each end and stretched, the center of the strip will rotate about an axis which is the center of the cross-section of the strip. One end of the twisted strip is held in a fixed position, while the other end is attached to a lever or crank connected with the measuring point of the instrument, as shown in Fig. 2. The indicating pointer *P* is secured to the center of the twisted strip. With this arrangement, the indicating pointer will be moved over a graduated scale when the measuring point at the lower end of member *A* is moved.

In the case of the twisted solid strip *A*, Fig. 1, the metal in the center of the section is compressed in winding, and elongated when the strip is stretched. To correct this condition, a series of perforations may be cut out of the central portion of the strip, giving it the form at *B*. Such a strip requires less energy to operate and also gives a greater rotative movement with a given tension on the strip than the one shown at *A*. The relation between the cross-section of the strip, elongation, pitch of winding, and the stretching force required

Fig. 2. Diagrams Illustrating Use of Helical Strip B in Amplifying Mechanism of Precision Gage

to produce rotation has been determined by trying different combinations of cross-section dimensions, pitch of twist, and size and number of perforations in the strip.

Within a certain range, the rotation of a strip about its center is practically directly proportional to the elongation. On one type of experimental strip, this portion of the curve covers a range of about 60 degrees. The rotation of the strip within this range is approximately 18 degrees for an elongation of 0.00039 inch. Tests show that a force of one gram produces a rotation of 5 to 7 degrees.

Another strip which requires a much lower operating force and produces a much higher amplification gives such a high rotative or amplifying effect that it does not need to be perforated if used within a range of 145 degrees rotation. By "operating force" is meant the force required to hold the pointer in the starting or zero position. The latter strip is 0.0042 by 0.0002 inch in cross-section, 1.5748 inches long, and has a twist of 2160 degrees.

By varying the dimensions of the cross-section, length, and pitch of the twist in the strip, it is possible to produce many different amplification ratios. The strips mentioned are only examples, and do not show the full possibilities of their use in amplifying mechanisms. The twisted strips, when properly mounted in an instrument, are surprisingly strong. The elongating force or tension required to produce rotation of the strip about its axis can be reduced to a minute fraction of the amount normally required by balancing the normal or initial tension with a permanent magnet.

The "Mikrokator" amplifying and indicating mechanism shown in Fig. 2 is fitted with a strip *B* like the one shown at *B*, Fig. 1. Spindle *A*, Fig. 2, which carries the measuring point at its lower end, is forced downward against stop *C* by a coil spring. To provide a frictionless support for the spindle at the lower end, it is fastened to a metal diaphragm *D*. This diaphragm is cut out, as shown by the plan view *E*, so as to provide maximum flexibility and not interfere with the free movement of the spindle.

The upper end of the spindle is fastened directly to horizontal spring *F* and the horizontal member of spring "knee" *G*. One end of the twisted strip is fastened directly to the vertical member of spring knee *G*. The other end is fastened to the adjustable spring support *H*. An upward movement of the spindle will cause the vertical member of spring knee *G* to move to the right. This movement of the spring knee results in an elongation of the twisted strip, and causes pointer *P*, fastened to the center of twisted strip *B*, to rotate across the scale of the instrument. Varying the height of the vertical member of the spring knee changes the ratio of amplification between the spindle and the pointer.

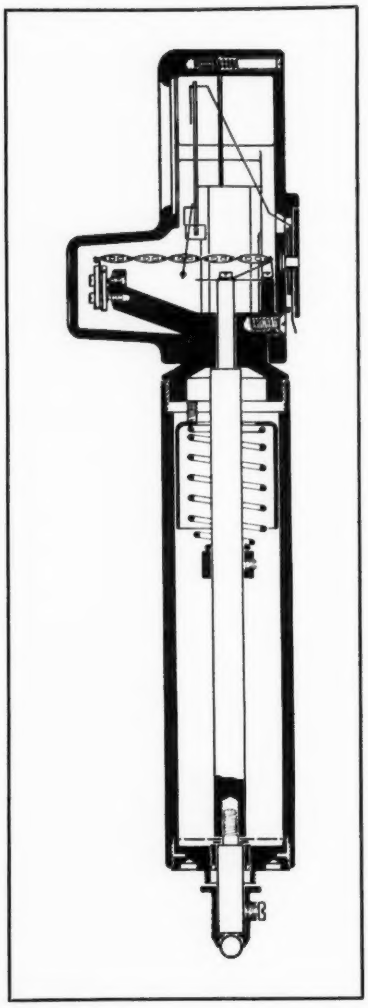


Fig. 3. Complete Precision Testing Instrument Using Amplifying Mechanism Shown in Fig. 2

The adjustable spring support *H* is used to adjust the pointer position and movement to suit the scale. For economical production, it is more practical to produce identical scales than an individual scale for each instrument. To permit the use of identical scales, the adjustable spring support *H* is provided for adjusting each mechanism until the pointer movement corresponds exactly to the scale graduations.

This adjustment is accomplished by an upward or downward movement of the plates *I* and *J*. These plates have elongated holes through which are passed the screws that clamp the plates to the frame. If the plates are moved up, the portion of spring support *H* that projects above the plates is reduced, and thus the spring support is stiffened; this causes greater elongation of the strip and greater movement of the pointer for a given movement of the spindle. If the plates are moved down, the portion of spring support *H* that projects above the plates is increased, and thus the spring support becomes more flexible, and, as it bends more easily, results in less elongation of the strip and a smaller movement of the pointer for a given movement of the spindle.

After the pointer has been adjusted so that it corresponds approximately to the scale graduations, the final adjustment is made by means of screw *K*. Adjusting plate *J* is slotted at the top, as shown, so that by turning screw *K* in a right-hand direction, the tongue at the top of the plate is moved upward, thus shortening the distance the spring projects above the supporting plate. By turning the screw in a left-hand direction, the tongue at the top of the plate is lowered, thus increasing the amount the spring projects.

This adjustment of the tongue has the same effect on the elongation of the strip and pointer movement as the adjustment of the plates *I* and *J*:

but as the adjustment is made by means of a screw, minute adjustments of the pointer movement are possible. These movements can be adjusted until the actual spindle movement, as checked with gage-blocks, is made to correspond exactly with the indicated movement of the pointer on the scale. The adjusting plates can be changed to increase or decrease the initial tension.

As the only damping effect on the pointer movement is furnished by the resistance of the air, it is very important that the weight and the inertia be reduced to a minimum. The pointer, which is mounted in the center of the strip, is made of tapered glass tubing. The tubing at the large end is approximately 0.0024 inch in diameter, and, at the small or outer end, 0.0012 inch in diameter. As a pointer of such small diameter would be very difficult to see, it is provided with a small circular disk just below the tip. This glass tube is so flexible that it can be bent as easily as a hair without danger of breakage, and will return to its original shape after bending.

If the pointer is allowed to swing freely from the extreme right or plus 0.003 inch reading back to zero, it takes about three-fourths second for it to move this distance and come to an absolute stop. On some production measuring applications, where a damping interval of three-fourths second is too great, a quicker damping effect is obtained by having the strip rotate in a drop of oil. The oil is held in a short length of split tubing which encircles the strip close to the point at which the pointer is fastened to the strip, as shown at *Q*, view *C*, Fig. 1. This makes it possible to obtain almost instant damping of the pointer movement.

The highest amplification on a standard instrument of this type is 3000 to 1. On this instrument, a movement of 0.0001 inch of the measuring tip causes a movement of 0.300 inch of the pointer. On the corresponding instrument, with a scale graduated in metric units, a movement of 0.001 millimeter of the measuring tip causes the pointer to move 3 millimeters.

The highest amplification provided on a special instrument had a ratio of 27,600 to 1. In this case, a movement of 0.001 millimeter of the measuring tip produces a pointer movement of 27.6 millimeters (0.000001 inch). The scale has graduations for each 0.00002 millimeter. The width of these graduations is 0.55 millimeter. On a corresponding instrument graduated in the English system a movement of 0.0001 inch of the measuring tip produces a pointer movement of 2.76 inches. Scale graduations are 0.028 inch wide for each 0.000001 inch.

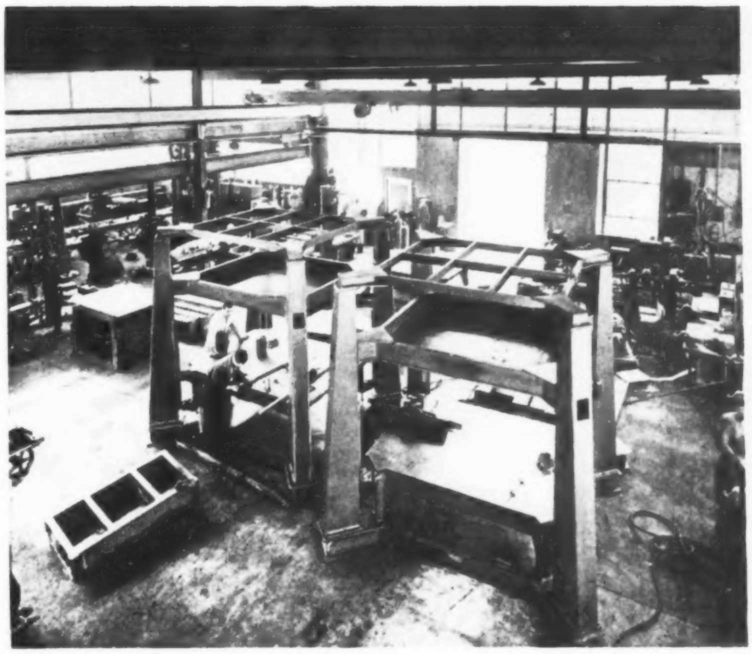


Fig. 1. Two Welded Frames for Large Hydromatic Welders

Fabricating by Welding Saves Time

Two machine frames for large hydromatic welders manufactured by the Multi-Hydromatic Welding & Mfg Co., Detroit, Mich., are shown in Fig. 1. The fabrication of these two large frames was accomplished with Lincoln arc-welding machines. Only seven days' working time was required to advance the work from the stage illustrated in Fig. 2 to completion. The manufacturer making the frames states that, if cast construction had been used, several weeks would have been required simply to make the patterns.

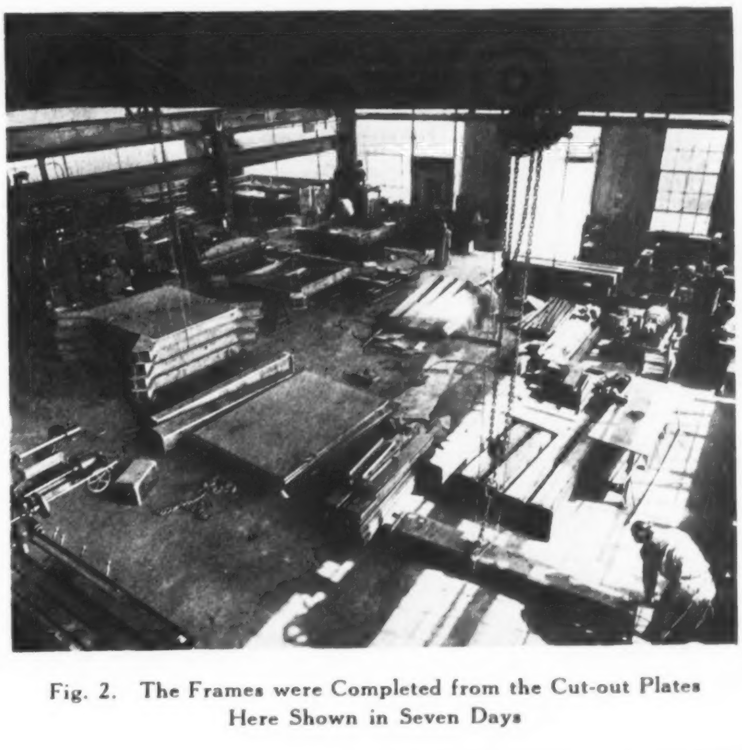
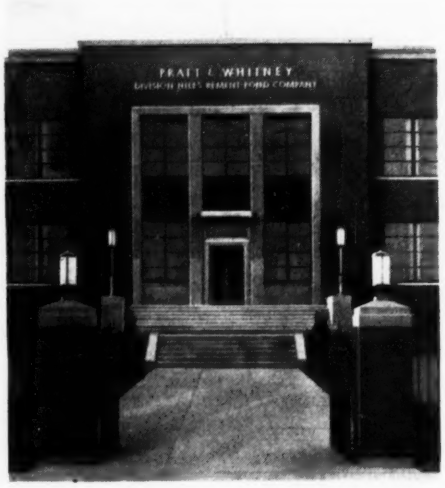


Fig. 2. The Frames were Completed from the Cut-out Plates Here Shown in Seven Days

The New Pratt & Whitney Plant



PRATT & Whitney now occupies a new and thoroughly modern plant at Charter Oak Park, West Hartford, Conn. The old plant consisted of twenty-three multistory buildings. The new one is a one-story building, about 1000 feet long and 550 feet wide, with a two-story office building and a two-story pattern storage building with garage and heating plant.

Pratt & Whitney occupied the old location for seventy-nine years, and some of the buildings have been in use since 1865. The new plant has been designed expressly to meet the needs of precision machine tool, small tool, and gage manufacture. One of the impressive features is the amount of glass used to insure adequate lighting (see accompanying illustrations). This glass, which has an area of about seven acres, was made by the flat-drawn process used for automobile safety glass.

Most of the factory floor is made of creosoted wood blocks, laid on edge in tar on a concrete base. Three million of these blocks were used. One section is covered with wood strip flooring (natural wood blocks laid on edge without tar) and will be devoted to fine bench work on gages. Still another section of the building will be used for heavy machine assembly. This floor is solid reinforced concrete, 2 feet thick. The administration building is made of concrete, and is floored with composition tile laid on the concrete.

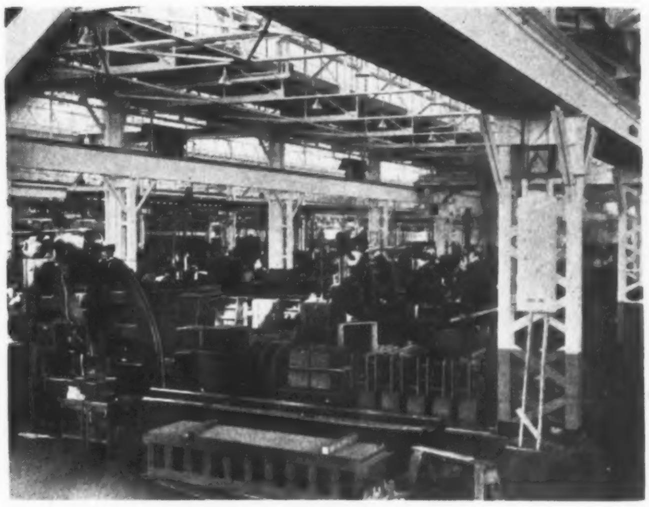
This new plant is heated by 152 steam-operated unit heaters and blowers. Three 400-H.P. oil-fired boilers, with steam at 200 pounds pressure, are used for heating only. Electricity for operating the plant is purchased. The initial voltage of 11,000 is reduced by four transformer stations in the plant to 220 volts, two phase, for power, and by separate transformers to 110 volts for lighting.

The equipment is so arranged that at a future date it will easily be possible to change over from 220 volts, two phase, to 440 volts, three phase, for power purposes—a more economical arrangement. It is estimated that the total occupied load will be 7500 kilowatts, with a maximum demand load of 2600 kilowatts and an average load of 2000 kilowatts. This includes all types of electrical equipment, such as motors, hardening furnaces, hoists, cafeteria kitchen, etc.

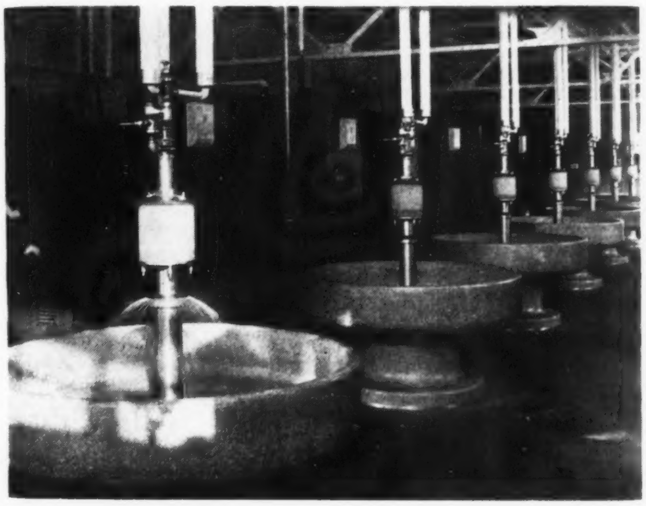
The new plant is so arranged that there is no lost motion in converting raw materials into finished products. For example, castings or other parts have to move only a few feet from one job to the next, because they follow the direct natural course, so that production is "streamlined" from one end of the plant to the other.

General View of New Pratt & Whitney Plant at Charter Oak Park, West Hartford, Conn.

Typical Machine Tool Assembly Floor in New Plant

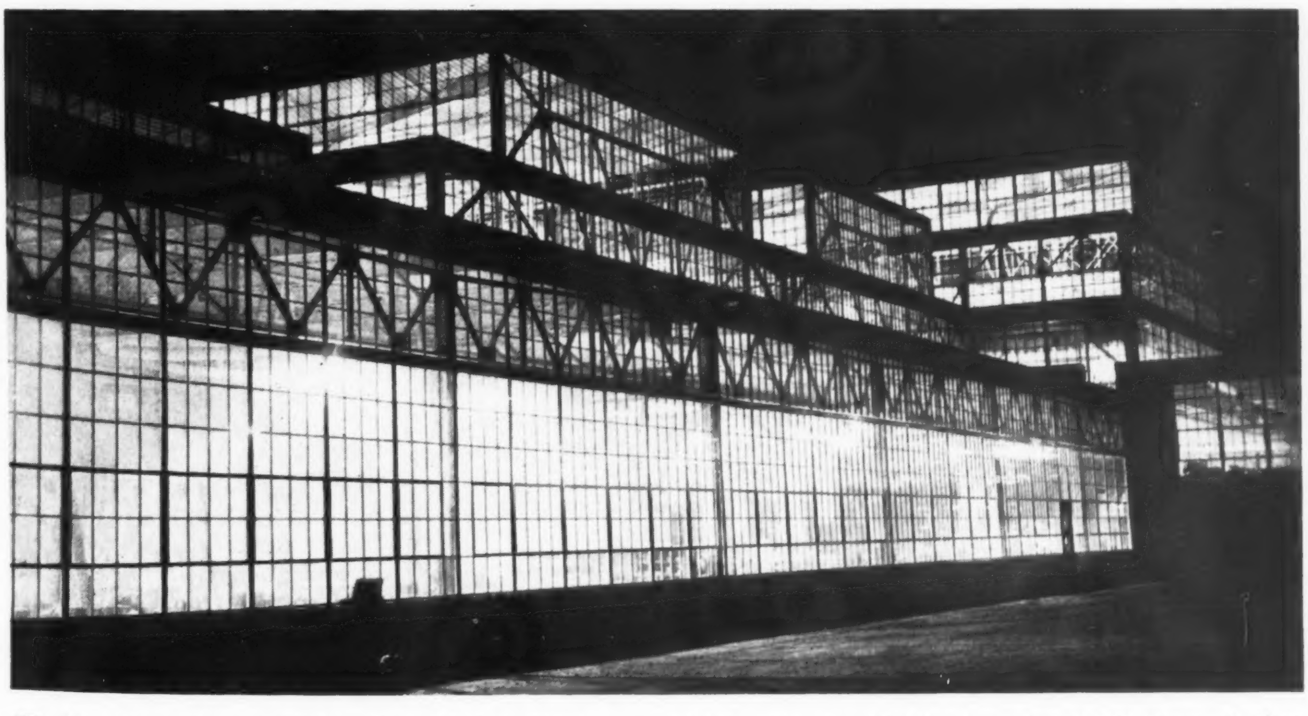


Looking Across Plant—Planer Floor in Foreground



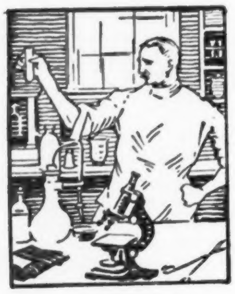
One of Several Locker- and Wash-rooms

Cafeteria which Seats 600—for Night and Day Shifts



The New Plant Glows at Night with its Modern Bluish-green Lighting Showing Vividly through 110,000 Panes of Glass

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Tellurium Coppers Having Unusual Combination of Properties

Two types of tellurium copper have recently been brought out by the Chase Brass & Copper Co., Waterbury, Conn., that have properties especially desirable for forgings and screw machine products. Type A combines high conductivity, unusual forgeability, and ready machinability. Type B is a hardenable copper alloy with a high degree of strength, forgeability, and machinability. Both types have unusual resistance to corrosion, season cracking, stress corrosion cracking, and fire cracking. These alloys are available in rod and tube form, and in a wide variety of sizes and shapes.

Type A, which has a nominal composition of 0.5 per cent tellurium and the balance copper, may be hot worked or forged within, and even beyond, a broad range of from 1200 to 1600 degrees F. The alloy can be quenched, air-cooled, or furnace-cooled, and the rate of cooling is not important. Cold-working can also be extensively performed, although at room temperature the alloy is less ductile than copper.

Type A tellurium copper machines about 25 per cent faster than leaded copper or free-cutting commercial bronze, and about 50 per cent faster than leaded silicon-bronze. The same tools, feeds, and speeds are used as for free-cutting brass, and exceptionally fine chips are obtained. The electrical conductivity is about 98 per cent of the International Annealed Copper Standard, while the corrosion resistance is essentially the same as that of ordinary commercial copper.

Forgings of Type A tellurium copper, as forged, have a tensile strength of 33,000 pounds per square inch; a yield strength of 8000 pounds per square inch; and 30 per cent elongation in 2 inches. Hard drawn rod in sizes up to 1/2 inch, inclusive, has a tensile strength of 50,000 pounds per square inch; a yield strength of 30,000 pounds per square inch; an elongation of 15 per cent in 2 inches; and a hardness of 50 Rockwell B. Tubes of drawn temper have a tensile strength of 46,000 pounds per square inch; a yield strength of 25,000 pounds per square inch; an elongation of 20 per cent in 2 inches; and a hardness of 40 Rockwell B.

Type B tellurium copper has a nominal composition of 0.5 per cent tellurium; 1 per cent nickel; 0.2 per cent phosphorus; and the remainder copper. This alloy has the same advantages as Type A and in addition, it can be hardened and strengthened by heat-treatment.

The complete heat-treatment consists, first, of a softening treatment, and second, of an aging hardening treatment. For softening, the material is heated to a temperature of between 1200 and 1600 degrees F. and water-quenched or rapidly air-cooled. The aging or hardening treatment consists of reheating the material to a temperature of about 850 degrees F. for one to two hours.

Forgings of Type B tellurium copper, as forged and aged, have a tensile strength of 60,000 pounds per square inch and a yield strength of 40,000 pounds per square inch. Heat-treated and hard drawn rod up to 1/2 inch, inclusive, has a tensile strength of 75,000 pounds per square inch; a yield strength of 50,000 pounds per square inch; an elongation of 15 per cent in 2 inches; and a hardness of 80 Rockwell B. Heat-treated and drawn tubes have a tensile strength of 70,000 pounds per square inch; a yield strength of 47,000 pounds per square inch; an elongation of 18 per cent in 2 inches and a hardness of 76 Rockwell B.......201

How the "Snow Cruiser" Wheels Were Made

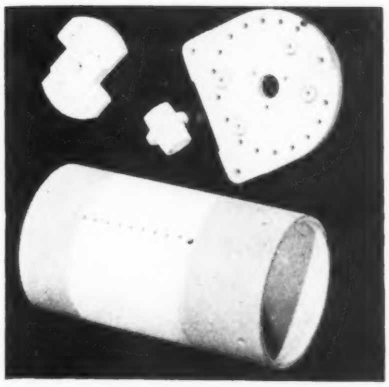
The newspapers have been full of accounts relating to the huge 37 1/2-ton "snow cruiser" which will soon be used in surveying vast areas of unexplored ice and snow in the southern polar regions. The wheels of the "snow cruiser" are of especial interest, not only because of the heavy strains to which they will be subjected in carrying the vehicle over trackless and uneven wastes, but because they must withstand high impact stresses at extremely low temperatures.

Each wheel weighs approximately 2000 pounds and has the following general dimensions: Diameter of outer and inner disks, 71 inches; diameter of drop-center rims, 66 inches; width of rim, out-

To obtain additional information about materials described on this page, see lower part of page 136.

side, 30 1/2 inches, and inside, 28 inches; and hub diameter, 20 inches.

The large disks were cut from 3/8-inch plates, the felloes were formed from 12-gage sheets, and the bracing ribs from 12-gage metal. The brake-drums were only 1/2 inch thick, and the cone-shaped hub was made of sheet metal 1/8 inch thick. These light but strong sections were made from Inland Hi-steel, which possesses, as one of its main characteristics, a high degree of resistance to repeated impact shocks at extremely low temperatures. It is pointed out by the producers that at 50 degrees F. below zero, Hi-steel will withstand impact stresses fifteen times greater than ordinary steel. The fatigue strength is almost 80 per cent greater, and the tensile strength 30 per cent higher, while the resistance to corrosion is 2 1/2 times as great...........202



Typical Parts Machined from Alsimag 222, a Recently Developed Ceramic Material

Machinable Ceramic Material Available in Bar, Tube, and Flat Form

A ceramic material that has the unusual property of being machinable after it has been strengthened by firing has been placed on the market by the American Lava Corporation, Chattanooga, Tenn. This property makes "Alsimag 222," as the material is called, especially suitable for use by inventors, research men, and development engineers in building working models of proposed equipment. The material can be used at temperatures up to 2500 degrees F., and it is therefore applicable for burners and heating supports.

Alsimag 222 can be turned in a lathe or milled like metal. The material is abrasive, and therefore it is necessary to use tools tipped with carbide in machining it. It has good dielectric properties, and shows low dielectric loss at high frequencies, thus being suitable for application in the electronic field.

The material is available in round and tubular form in sizes up to 3 inches diameter, and in disks and plates up to 10 inches in diameter. Special shapes can also be supplied............203

New Alloy for High-Temperature Applications

A new alloy known as Croloy 7 has recently been developed by the Babcock & Wilcox Tube Co., Beaver Falls, Pa., to meet the service requirements for a steel intermediate between Croloy 5 (5 per cent chromium and 0.50 per cent molybdenum) and Croloy 9 (9 per cent chromium and 1.25 per cent molybdenum). The new alloy is suitable for high-temperature applications as, for example, in the construction of oil-refinery cracking-still tubes and steam superheaters. It has an analysis of: Carbon, 0.15 per cent maximum; manganese, 0.50 per cent maximum; phosphorus, 0.030 per cent maximum; sulphur, 0.030 per cent maximum; silicon, 0.50 to 1.00 per cent; chromium, 6.50 to 7.50 per cent; and molybdenum, 0.45 to 0.65 per cent.

The new alloy offers considerably greater resistance to corrosion and oxidation than the 5 per cent chromium type because of its higher chromium content. It is therefore applicable where fairly severe corrosion may be encountered..........204

The Weight of the Rotary Snow Plow Widener Here Shown Mounted on a Truck was Decreased 1000 Pounds by Substituting High Tensile Steel for Ordinary Structural Steel. Man-Ten High Tensile Steel of No. 12 Gage was Used for the Mold Board, and the Same Material, 3/16 Inch Thick, for the Bracing in Back of the Wing. With This Construction, the Unit Weighs Less than 1300 Pounds, as against the Former Weight of 2300 Pounds. Man-Ten High Tensile Steel is a Product of the United States Steel Corporation

To obtain additional information about materials described on this page, see lower part of page 136.

NEW TRADE LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts and Materials. To Obtain Copies, Check on Form at Bottom of Page 135 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the February Number of MACHINERY

Standard Gages

STANDARD GAGE CO., INC., Poughkeepsie, N. Y., is distributing a book on gages and their application containing information of value to all users or purchasers of gages. The book covers this concern's complete line of standard gages, designed in conformity with the specifications of the American Gage Design Committee. It shows dial indicator, snap, plug, ring, and other gages for practically every class of work, including internal and external gaging; taper gaging; keyway and spline gaging; as well as other gaging operations required in producing high-precision work. Chromium-plated gages and cemented-carbide tipped gages are also listed. In addition to giving complete specifications, including range, accuracy, and prices, illustrations show, in some cases, exactly how the gages are applied. 1

Electric Equipment

GENERAL ELECTRIC CO., Schenectady, N. Y., Circulars GEA-1724B and 3225, covering, respectively, synchronous motor control with new SCI relay; and power factor and its improvement with G-E Pyranol capacitors. Circular GES-2136, entitled "Little Known G-E Products for Industry," describing twenty-eight special products, including instruments of use in the laboratory, as well as for production testing or inspection. Bulletins GEA 3339, on automatic time switches; 3250, on magnetic starters; 2707A, on reclosing fuse cut-outs; 1993F, on enclosed indicating and drop-out fuse cut-outs; and 3259, on magnetic contactors for battery-vehicle control. 2

Welding Machines

LINCOLN ELECTRIC CO., Cleveland, Ohio. Circular entitled "How to Build Your Own Engine-Driven Welder," containing information based on the experiences of hundreds of job welders, blacksmiths, and machinists who have purchased a Lincoln welding generator and built their own portable engine-driven welders. Welder Specification Bulletin 336, illustrating and describing the Lincoln 200-ampere engine-driven "Shield-Arc Junior" welder and its application. 3

Small Tools and Accessories

GEORGE GORTON MACHINE CO., 1109 Thirteenth St., Racine, Wis. Catalogue 1317-B, illustrating and describing small tools and accessories, including new double end mills and holders; new jig boring-bars and boring heads; cutter grinding machines; graduating machines; and other useful tools. Data includes prices. 4

Data on Honing

BARNES DRILL CO., 814 Chestnut St., Rockford, Ill. Bulletin 121E, containing information of value to the shop man on the honing process, including such data as work adapted to honing; preparation; recommended speeds; power required, etc.; also describes the Barnes self-oiling hydraulic honing machines. 5

Presses

NIAGARA MACHINE & TOOL WORKS, 637-697 Northland Ave., Buffalo, N. Y. Bulletin 64-F, illustrating and describing Niagara double crank presses, designed to produce large pressed-metal parts, such as are used by the automotive, airplane, electrical, refrigerator, and other industries. 6

Oil Filters

ZENITH CARBURETOR DIVISION, BENDIX AVIATION CORPORATION, 696 Hart Ave., Detroit, Mich. Bulletins 128-B, 132-B, 134-A, 136-D, 148-A, 153-A, 172-A, and 201, illustrating and describing Zenith filters for the filtration of cutting oil, lubricating oil, hydraulic fluids, and for removing water from compressed air lines. 7

Heat- and Corrosion-Resisting Castings

STANDARD ALLOY CO., INC., 1679 Collamer Road, Cleveland, Ohio. Catalogue 39, describing how specific heat- and corrosion-resistance problems have been solved in actual practice by the use of Standard nickel-chrome castings; also contains suggestions on machining and welding. 8

Couplings

FARREL-BIRMINGHAM CO., INC., 344 Vulcan St., Buffalo, N. Y. Catalogue 443, on Farrel "Gearflex" couplings, containing information on the most efficient means of compensating for misalignment of connected machine shafts. Rating, dimension, and selection data are included. 9

Universal Drill Jigs

CLEVELAND UNIVERSAL JIG CO., 13328 St. Clair Ave., Cleveland, Ohio. One hundred-page catalogue covering the line of universal drill jigs and other fixtures made by this concern, including two new styles of jigs, as well as parts that enable customers to build their own jigs when desired. 10

Automatic Screw Machines

GEORGE SCHERR CO., INC., 128 Lafayette St., New York City. Catalogue illustrating and describing Tornos high-speed automatic screw machines designed to produce work of extreme accuracy, such as is required in making watches, gages, airplane parts, etc. 11

Precision Surface Grinding Machine

ROBOT MACHINERY CO., 326-340 Ten Eyck St., Brooklyn, N. Y. Catalogue illustrating and describing a new precision surface grinding machine designed to grind surfaces parallel and straight within 0.0001 inch. 12

Lathes

PRATT & WHITNEY DIVISION NILES-BEMENT-POND Co., Hartford, Conn. Catalogue illustrating and describing the construction details of the Pratt & Whitney Model C lathe, which is designed to meet the demands of modern tool-room practice 13

Electric Measuring Instruments

LEEDS & NORTHRUP Co., 4921 Stenton Ave., Philadelphia, Pa. Condensed catalogue E, covering the entire Leeds & Northrup line of electrical measuring instruments for research and routine testing in laboratory, plant, and field. 14

Hand Millers

FREW MACHINE Co., 132 W. Venango St., Philadelphia, Pa. Bulletin 103B, descriptive of Frew hand millers, made in belt- and motor-driven styles, as well as in a duplex style adapted for medium and short duplex milling operations. 15

Self-Lubricating Bearings

JOHNSON BRONZE Co., 520 S. Mill St., New Castle, Pa. Catalogue L-2, containing new size listing of Ledaloyl self-lubricating bronze bearings. Technical and application data are included. 16

V-Belt Drive Design

B. F. GOODRICH Co., Akron, Ohio. Catalogue Section 2180, on fractional-horsepower V-belt drive design, containing information of value in selecting a V-drive. Data is also given on V-belt practice, including installation information. 17

Roller Bearings

SHAFER BEARING CORPORATION, 35 E. Wacker Drive, Chicago, Ill. Catalogue 15, covering Shafer radial-thrust roller bearings and self-aligning units. Several new and improved designs are described, and typical applications illustrated. 18

Carboloy Tools

CARBOLOY COMPANY, INC., 11147 East 8 Mile Road, Detroit, Mich. Engineering bulletin GT-120, containing comprehensive instructions for machining steel with carbide tools, based on an extended period of development work. 19

Grinding Machines

DOALL Co., Minneapolis, Minn. Circular illustrating and describing a Doall grinder equipped with interchangeable heads, which adapts it for use either as a universal cutter grinder or as a precision surface grinder. 20

Engraving and Marking Machines

H. P. PREIS ENGRAVING MACHINE Co., 155 Summit St., Newark, N. J. Bulletin L-339, illustrating and describing the Panto engraver with interchangeable heads for engraving and electrical marking. 21

Meehanite Castings

MEEHANITE RESEARCH INSTITUTE OF AMERICA, INC., 311 Ross St., Pittsburgh, Pa. Bulletin 10, entitled "Meehanite—the Metal for Pressure Castings," listing five principal reasons why Meehanite is used extensively for this service. 22

Safety Guide-Post Covers for Dies

DANLY MACHINE SPECIALTIES, INC., 2112 S. 52nd Ave., Chicago, Ill. Circular descriptive of Danly safety guide-post covers for dies, designed to reduce accidents. 23

Stainless-Clad Steel

JESSOP STEEL Co., 605 Green St., Washington, Pa. Booklet containing useful information on Jessop Silver-Ply stainless-clad steel, including methods of machining, welding, fabricating, etc. 24

Precision Lathes

SOUTH BEND LATHE WORKS, 719 E. Madison St., South Bend, Ind. Catalogue 50, illustrating and describing the company's complete line of 9-inch "Workshop" back-geared screw-cutting lathes. 25

Generator Voltage Regulators

BURLINGTON INSTRUMENT CORPORATION, Burlington, Iowa. Bulle-

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tin GB-234, covering the application, construction, operation, maintenance, and installation of automatic generator voltage regulators. 26

Oil-Hardening Steel

CRUCIBLE STEEL CO. OF AMERICA, 405 Lexington Ave., New York City. Folder containing information on "Ketos"—an oil-hardening tool steel —including general instructions for forging and heat-treating. 27

Gear Oils

E. F. HOUGHTON & CO., Third, American, and Somerset Sts., Philadelphia, Pa. Leaflet containing information on Houghton's Vital E. P. gear oils and the service obtained with them in actual use. 28

Gear Chucks

GARRISON MACHINE WORKS, INC., Dayton, Ohio, are distributing terse information on gear chucks in the form of so-called "chuckgrams," which have the general appearance of a telegram. 29

Ball Bearings

NEW DEPARTURE DIVISION GENERAL MOTORS SALES CORPORATION, Bristol, Conn. Booklet R-9—1940 edition of ball-bearing interchangeability tables. 30

Variable-Speed Drives

REEVES PULLEY CO., Columbus, Ind. Circular showing several applications of Reeves modern variable-speed drives on machines already in use, and describing the production gains effected. 31

Monel Metal

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York City. Revised edition of Bulletin T-9 covering engineering properties, working instructions and applications of "K" Monel. 32

Self-Oiling Honing Machines

BARNES DRILL CO., 814 Chestnut St., Rockford, Ill. Bulletin 146, describing the features and advantages of the "Barnesdril" vertical self-oiling honing machine. 33

Chrome-Plated Gage-Blocks

FORD MOTOR CO., Johansson Division, Dearborn, Mich. Leaflet on chrome-plated Johansson gage-blocks, the plating being applicable to both worn and new sets. 34

Ball Bearings

NICE BALL BEARING CO., 30th and Nicetown Lane, Nicetown, Philadelphia, Pa. Catalogue 110, on the Nice line of ball bearings, including stainless-steel bearings. 35

Grinders and Sanders

ROTOR TOOL CO., Cleveland, Ohio. Catalogue 22, covering four new rotor grinders for vertical grinding, disk sanding, wire brushing, and stone work. 36

Precision Boring Machines

MOLINE TOOL CO., Moline, Ill. Catalogue describing the Moline No. 116 FB multiple-spindle precision boring machine. 37

Files for Stainless Steel

NICHOLSON FILE CO., Providence, R. I. Leaflet descriptive of a new Nicholson file developed for use on stainless and other alloy steels. 38

Gas Furnace Control

NORTH AMERICAN MFG. CO., 2910 E. 75th St., Cleveland, Ohio. Circular 1139, on a new air-gas Ratiotrol for industrial furnaces, etc. 39

Portable Electric Tools

BLACK & DECKER MFG. CO., Towson, Md. 1940 catalogue covering the complete Black & Decker line of portable electric tools. 40

Milling Machine Attachments

FRAY MACHINE TOOL CO., 515 W. Windsor Road, Glendale, Calif. Circular on various types of milling machine attachments. 41

Tapping Machines

L. J. KAUFMAN MFG. CO., Manitowoc, Wis. Folder on pneumatic oscillating tapping machines. 42

Portable Conveyors

ALUMINUM LADDER CO., Tarentum, Pa. Catalogue on aluminum portable gravity conveyors. 43

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Which of the new or improved equipment described on pages 137-149 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment mark with X in the squares below, the identifying number found at the end of each description on pages 137-149—or write directly to the manufacturer, mentioning machine as described in February MACHINERY.

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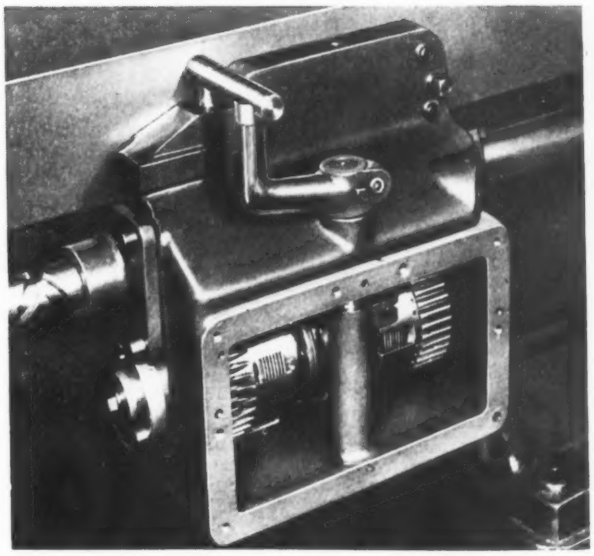
Shop Equipment News

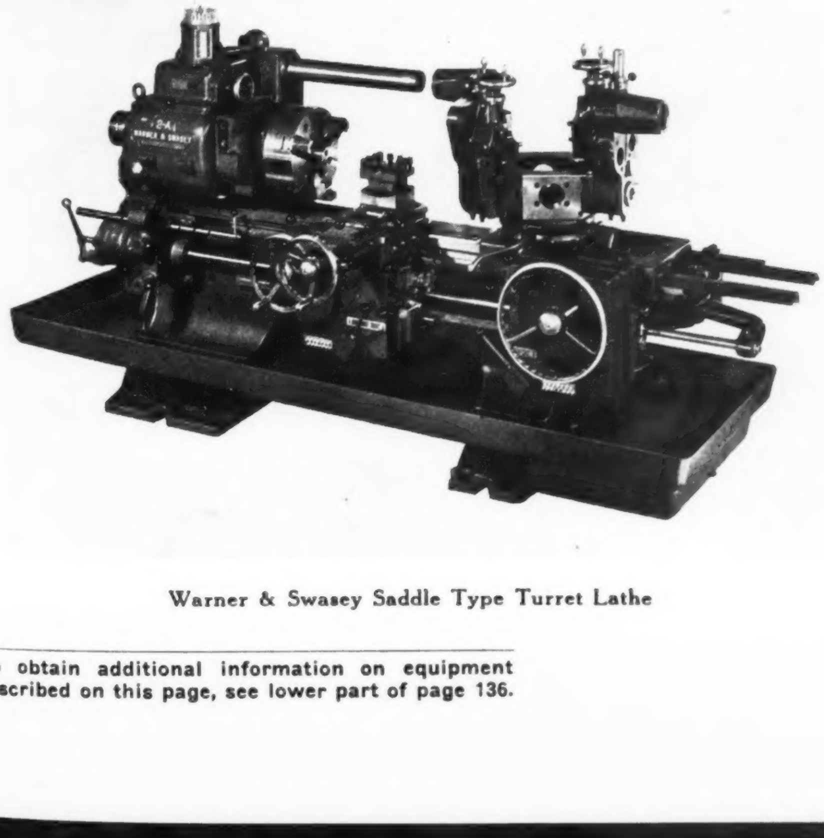


Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Warner & Swasey Saddle Type Turret Lathe

The Warner & Swasey Co., Cleveland, Ohio, has brought out a new 2-A saddle type turret lathe which has an effective swing of 20 inches and a bar capacity through the spindle of 3 1/2 inches. Many important details of this machine have been redesigned, the major improvements including a heavier walled hexagon turret; completely redesigned aprons; a new type single-lever control for feed selection; a new head brake; and an improved system for lubricating the headstock. The new machine is equipped with the preselector provided on other machines of the company's manufacture, which has previously been described in MACHINERY.

The rigid bed design which is now used on all of the company's saddle type machines is also incorporated in this machine. The multiple-disk clutches shown in the heading illustration are used for the rapid traverse movements. These clutches not only facilitate the application of power to the turret unit, but give the operator better control over its operation. Only a slight pressure on the control lever is required to cause the heaviest turret and tool assemblies to move smoothly and quickly along the bed. The rapid-traverse nuts are mounted on anti-friction bearings to relieve the feed-shaft proper from radial loads, and thus prevent it from being subjected to unnecessary strains or distortion.

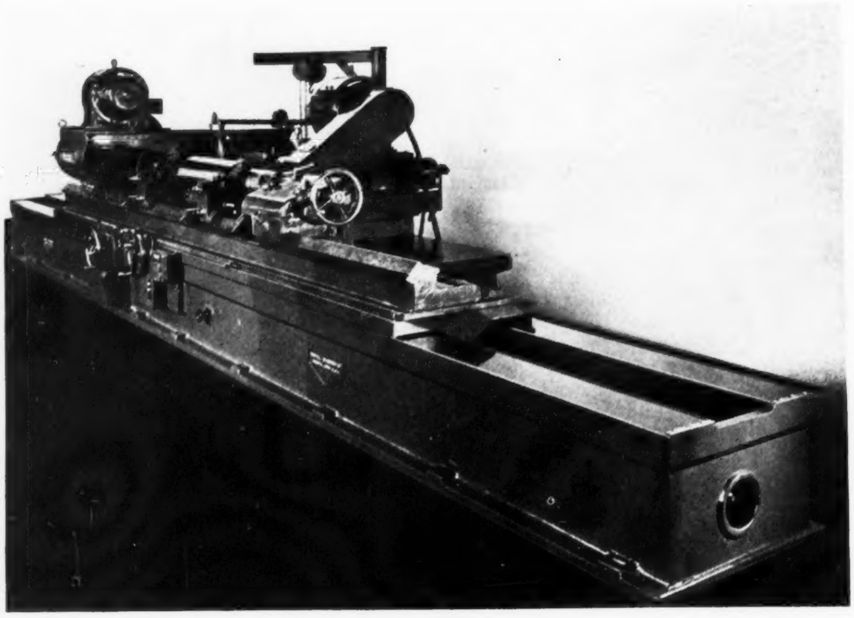


Warner & Swasey Saddle Type Turret Lathe

There are twelve spindle speeds ranging from 17 to 460 R.P.M. This speed range is doubled when a two-speed motor is employed. The gearing, bearings, and lubrication system are designed to handle the heavy loads imposed by the use of modern cutting tools. The universal cross-slide has sixteen reversible power feeds which increase uniformly to provide a proper range for all classes of work.

The machine can be equipped with a cross-slide taper attachment, an open type square turret, hand- or power-feed compound cross-slide, independent lead-screw attachment, thread-chasing attachment, or other auxiliary equipment designed to meet any particular production problems that may be encountered. 51

To obtain additional information on equipment described on this page, see lower part of page 136.



Farrel-Birmingham Cylindrical Grinding Machine Equipped with a Traveling Work-table

New Cylindrical Grinder with Traveling Work-Table

A cylindrical grinder with several new and improved features has recently been developed by the Farrel-Birmingham Co., Inc., of Ansonia, Conn. This machine, known as the Farrel Type TT grinder, has a traveling work-table and a fixed grinding wheel unit. It is equipped with a sensitive reversing mechanism, which permits grinding up to the shoulder of a shaft. Once set, the traverse and reversal of the work-table are automatic.

All mechanical and electrical operating controls are within easy reach of the operator's station. A handwheel and clutch are provided to permit moving the table by hand. Hand-feeding of the grinding wheel is accomplished by means of a handwheel, and there are electrical controls for rapid in-and-out movements of the wheel-head. The table can be reversed by hand or automatically, and lever contact control is provided for rapid traversing of the table.

Start and stop push-button stations control the motors that drive the grinding wheel, table, and water pump. A start, jog, and stop station controls the headstock. There is also an emergency master stop station with reset button and red indicating light.

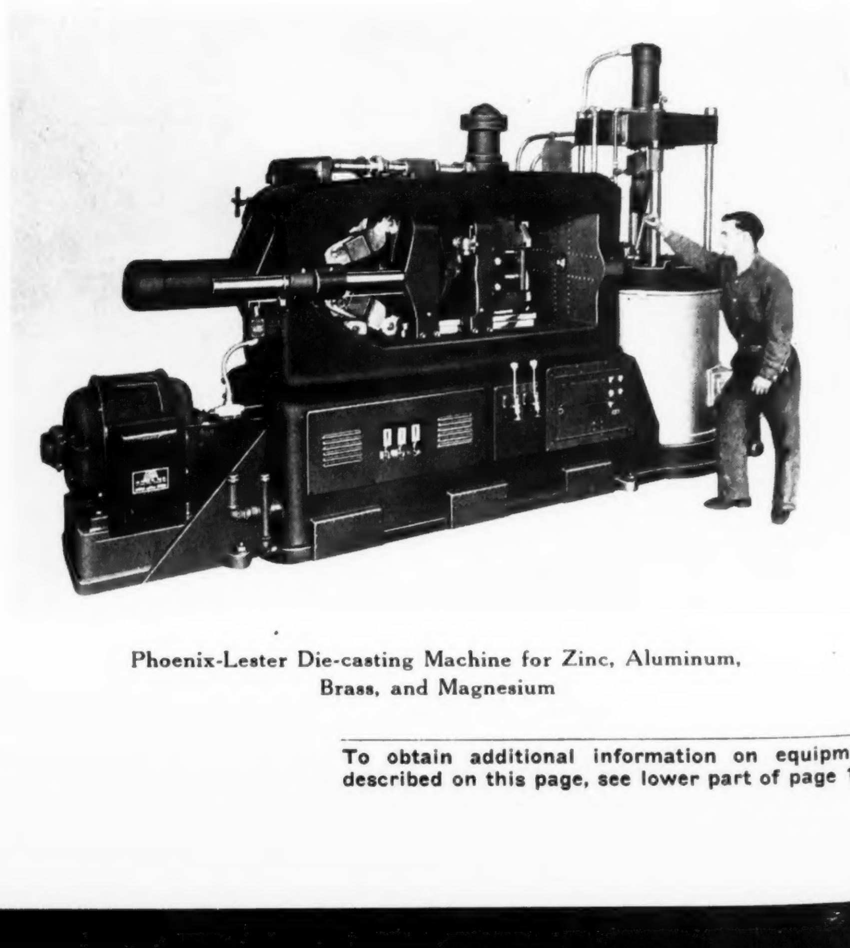
The work-table, which runs on inverted V-ways, is superimposed on the front bed of the grinder. On the table are mounted the headstock, including the motor and drive, footstock, and neck-rests for supporting the work. A back bed is provided for the grinding wheel unit. This bed is keyed and bolted to the front bed. The wheel-head rests on a sub-base which is hinged in front on two tapered trunnions. An intermediate base is interposed between the sub-base and the back bed. Seven motors are required for the operation of this machine, eight being needed if a taper grinding mechanism is included in the equipment. The grinding wheel, headstock, and the gear unit for the traveling table are driven by V-belts. 52

Phoenix-Lester Die-Casting Machine

The Phoenix Machine Co., 2711 Church Ave., Cleveland, Ohio, has developed a die-casting machine for zinc, aluminum, brass, and magnesium. The versatility of this machine adapts it for the production of parts for any field in which die-castings are used, including parts for ornamentation or for use where the casting must meet definite specifications with respect to dimensions, strength, and density.

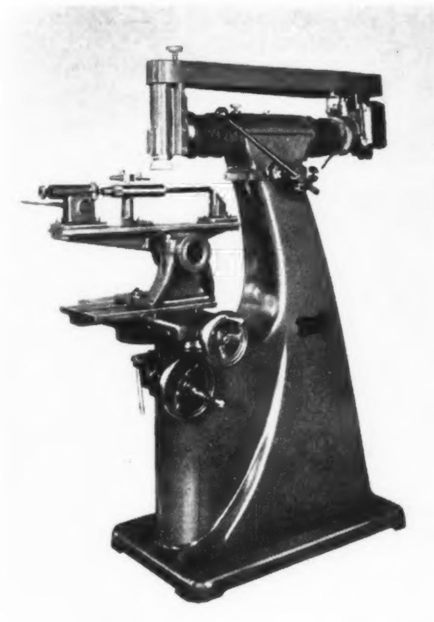
This die-casting machine, designated the HHP-3, is so designed that both zinc and aluminum can be cast on the same machine by employing interchangeable parts and injection plungers. All pressure is supplied by direct-driven pumps, eliminating the need for accumulator bottles. The speed of the plunger can be controlled, making possible a very fine control of injection speeds to suit varying conditions of temperature, type of metal, and mold construction. The pressure exerted on the plunger can also be controlled.

A ratchet worm movement for advancing or withdrawing the movable platen provides for quick mounting of the die. Die locking is effected with pressures up to 400 tons, and the entire machine is held securely with a beam construction. The platens are always held parallel because of the central die adjustment and beam construction. All operations can be controlled either manually or automatically, as desired. 53



Phoenix-Lester Die-casting Machine for Zinc, Aluminum, Brass, and Magnesium

To obtain additional information on equipment described on this page, see lower part of page 136.



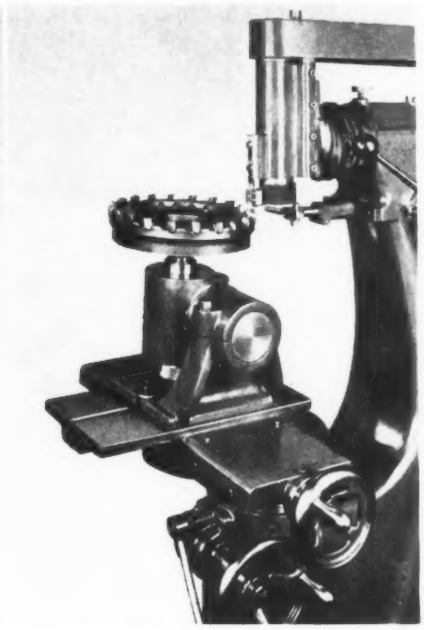


Fig. 1. (Left) Oliver Cutter Grinder with Work-supporting Centers in Place.
Fig. 2. (Right) Oliver Cutter Grinder with Adjustable Bearing Head

Oliver Tool and Cutter Grinder

The Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich., has brought out a new tool and cutter grinder in which the operating principles of the company's preceding machines have been retained and supplemented by notable improvements. This machine is designed to grind all types of milling cutters and reamers with a minimum number of attachments. It is shown with cutter-supporting centers in place in Fig. 1. Fig. 2 shows the machine equipped with the adjustable Timken bearing head with taper for mounting the various types of cutters for which it is adapted.

With this machine, the grinding operation is performed in the reverse order from that followed with the usual type of cutter grinder in that the work is held stationary while the grinding wheel traverses the cutting edge of the tool. The grinding wheel is carried on the forward end of a ram which sides in a fixed bearing at the upper end of the pedestal. The motor is mounted on the rear end of the ram, and is belted to the grinding wheel spindle.

The grinding wheel has a stroke of 10 inches and a bearing length of 15 inches. It is actuated by a rack and gear, which, in turn, is operated by a lever that can be adjusted to any convenient position. The advantage of this method of grinding cutters is that the operator stands in a natural and convenient position, with the work directly in his line of vision. Under these conditions, it is easier to guide the cutter against the lip rest.

Face mills up to 14 inches in diameter can be ground on the face and periphery at one setting, and various odd types, such as dovetail cutters, are easily ground with the same fixture. The grinder can be supplied with or without fixtures, and is adapted for single-operation grinding on production work. Special fixtures have been developed for grinding round corners on end-mills, for broach grinding, tap grinding, point thinning, etc. 54

Jackson High-Speed Vertical Boring Machine and Die-Sinking Machines

The Jackson Machine & Tool Co., 248-250 E. Wesley St., Jackson, Mich., has recently brought out the high-speed precision ball-bearing vertical drilling, boring, and milling machine shown in Fig. 1 for the production milling and boring of pockets and slots, and for handling plain angular and compound angular work up to 90 degrees without changing the setting of the work. The column, knee, saddle, and table are scraped and accurately fitted. Graduated screw dials and hand-lock levers are provided.

The spindle has a No. 10 B. & S. taper, and there is a hole extending through its entire length for a draw-bar. The vertical motion of the spindle is obtained through a worm and worm-gear. The motor bracket and spindle housing comprise one unit, with the motor anchored to the rear of the column, a hand lock-nut being provided to facilitate belt adjustment. It is possible to turn the spindle 120 degrees clockwise or counter-clockwise, thus permitting the operator to take a milling cut in the side of the work without disturbing the set-up.

The distance from the column to the center of the cutter is 9 inches; the spindle capacity, 3/4 inch; the vertical spindle travel, 4 inches; the vertical travel of the table, 15 inches; the cross travel, 9 inches; and the longitudinal travel, 18 inches. A V-belt is employed for the drive

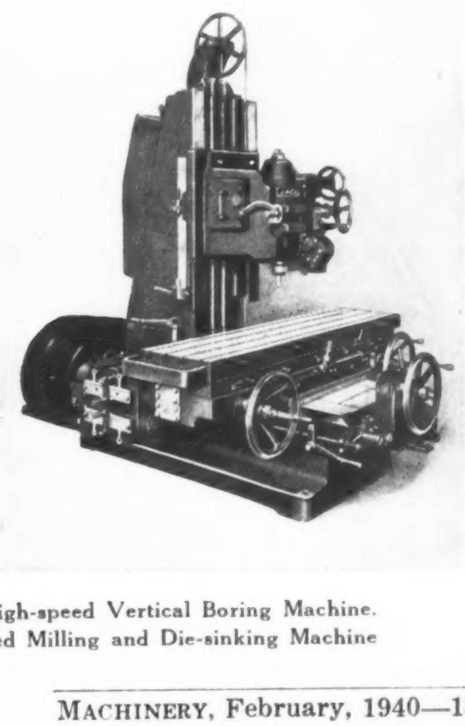


Fig. 1. (Left) Jackson High-speed Vertical Boring Machine.
Fig. 2. (Right) High-speed Milling and Die-sinking Machine

To obtain additional information on equipment described on this page, see lower part of page 136.

from the 110-220-440 volt, 3/4-H.P. motor. There are five speeds ranging from 200 to 3000 R.P.M. The machine has an over-all height of 5 feet 9 inches and the weight is about 1030 pounds.

The same company has also brought out the No. 10 Jackson duplex typeless high-speed ball-bearing milling and die-sinking machine shown in Fig. 2. At the right of the spindle is shown the cherrying tool mechanism, which is an outstanding feature of this equipment. Narrow or wide semicircular depressions with straight or nearly straight ends can be machined quickly and accurately with this tool. Its practical application is found in squaring up the ends of depressions in dies for shafts, and forming depressions for making flanges forged on the ends of crankshafts, depressions for the cheeks of crankshafts, depressions for cams forged integral with crankshafts, etc.

The vertical movement of the head is 22 3/4 inches; the distance from the center of the spindle to the face of the column, 18 1/2 inches; the maximum distance from the table to the end of the spindle, 28 1/2 inches; and the speed of the spindle, 40 to 413 R.P.M. The operating speed of the cherrying tool ranges from 13 to 138 strokes per minute. The vertical feed per revolution of the spindle is from 0.0002 to 0.0026 inch. The horizontal feed per revolution of the spindle ranges from 0.0012 to 0.0156 inch.

Still another die-sinker recently brought out by this company is designated the No. 6 Jackson duplex typeless. This machine is provided with power feed in all directions and is intended for large-volume production. When using a cherrying tool, the spindle can be swung out to the side of the machine, giving full view of the work.

The distance from the center of the spindle to the face of the column is 14 inches, and the longitudinal feed 39 1/2 inches. The machine has a cross-feed of 12 inches, a vertical feed of 21.5 inches, and a table surface of 13 by 48 inches. 55

Zeh & Hahnemann Double-Crank Presses

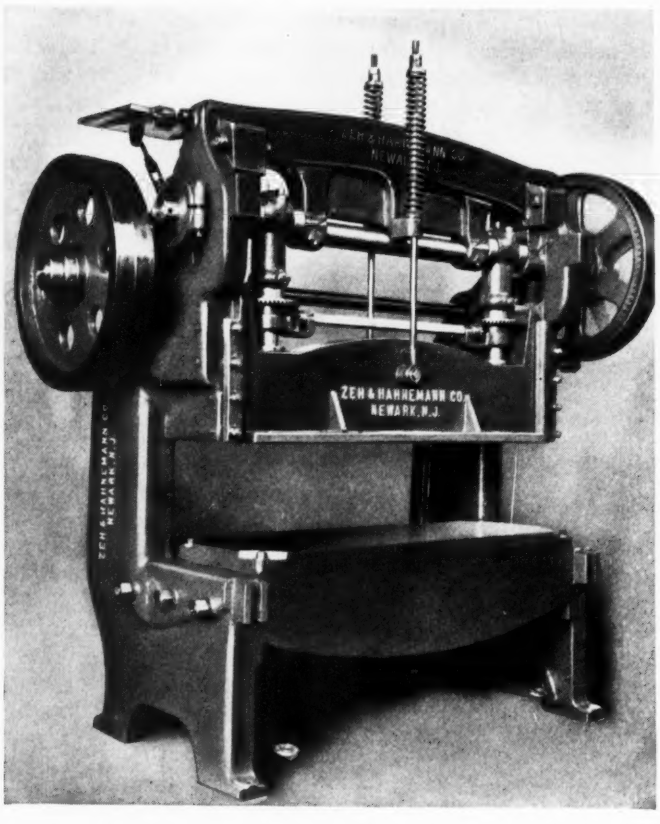
The Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J., has recently added to its line of presses a Type 13 machine which has been built in 25- and 36-ton sizes and can be furnished in larger sizes if desired. These presses are of the double-crank overhanging type, and are so designed that they can be built to meet various right to left dimensions.

The larger presses are built with spring balanced slides. The press shown in the accompanying illustration is back-geared, but machines of this type can also be furnished without back-gears. 56

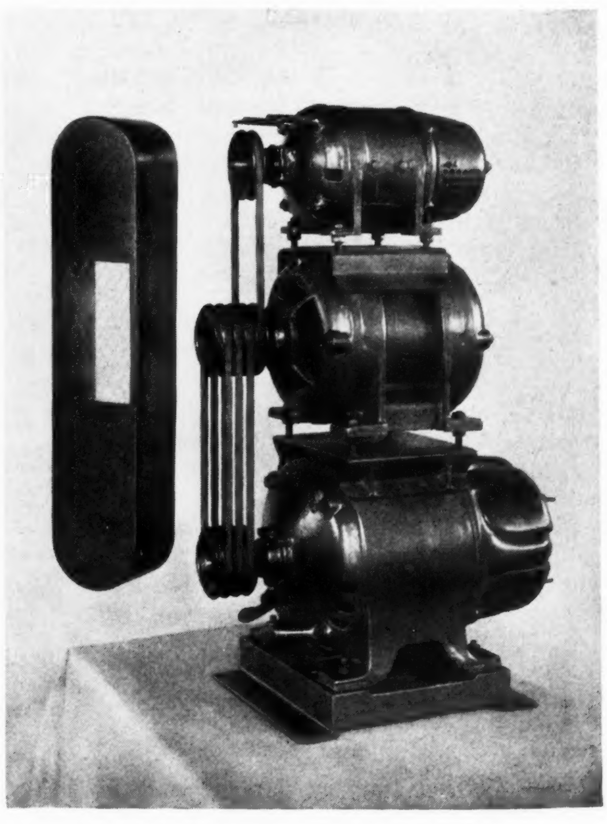
Pyramid-Mounted Motor-Generator Sets

Saving in floor space, accessibility, and the availability of machines of different speeds are outstanding features of a new pyramid-mounted arrangement of three-machine motor-generator sets brought out by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. These new sets, developed at the Norwood, Ohio, Works of the company, have the generator, motor, and exciter assembled one above the other, so that the floor space occupied is equal only to that required by the generator.

On top of the generator is placed the induction motor, securely attached with a baseplate, and the exciter in like manner is mounted on top of the motor. The generator and exciter are driven by Texrope V-belts from the motor shaft, adjustment being provided in the motor and



Zeh & Hahnemann Type 13 Double-crank Press



Allis-Chalmers Pyramid-mounted Motor-generator Set

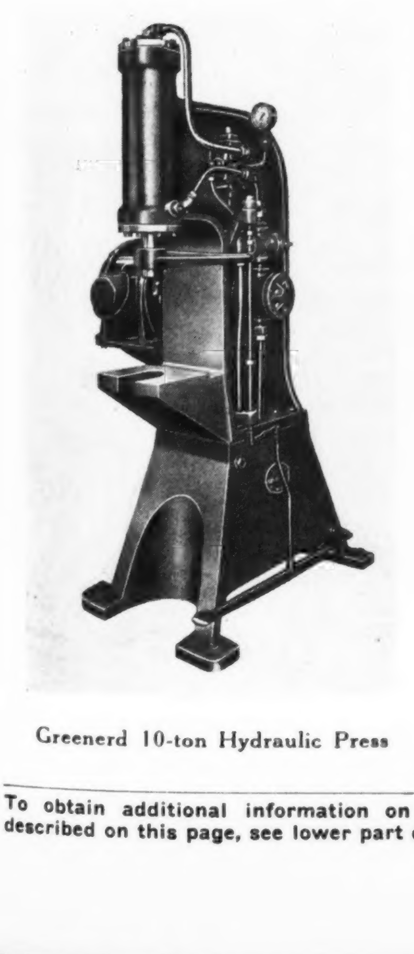
To obtain additional information on equipment described on this page, see lower part of page 136.

exciter baseplates. Motor-generator sets of this type are available at present in sizes up to and including 10 kilowatts. Each machine of this set is self-contained and readily removable as a separate unit. 57

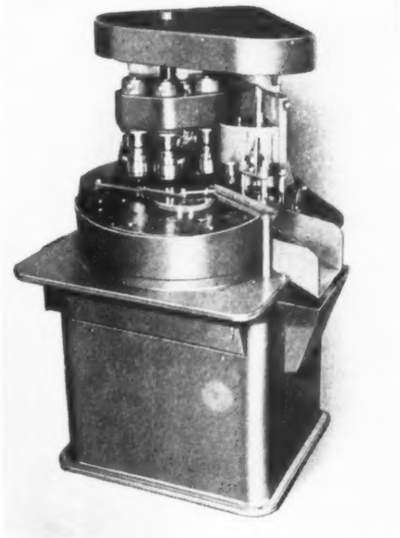
Greenerd 10-Ton Hydraulic Press

The Greenerd Arbor Press Co., Nashua, N. H., has brought out a No. H-58 hydraulic press for work that requires a machine with a very ruggedly constructed frame designed for minimum deflection. By using the same alloy semi-steel cast frame and changing the hydraulic and motor equipment, this machine can be furnished in five different models, some with high speed and others with double pump arrangements for rapid traverse up to 4 tons pressure and a change-over to slower working speeds for higher pressures.

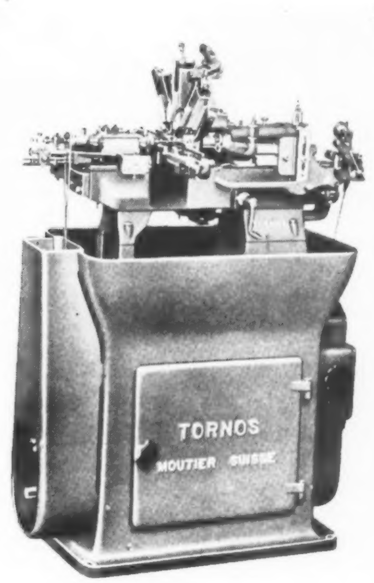
The movement of the ram is controlled by pressure on a foot-pedal. Pressure on the work is maintained as long as the foot-pedal remains depressed. When the foot-pedal is released, the ram returns automatically to the power stop, which may be set at any predetermined point within the 16-inch stroke range of the ram. The length of the ram stroke can be adjusted from 1 to 16 inches, and the pressure can be set for any amount between 2 1/2 tons and the full capacity of the press. 58



Greenerd 10-ton Hydraulic Press



Kaufman Semi-automatic Threading and Reaming Machine



Improved Tornos Automatic Screw Machine

Kaufman Semi-Automatic Threading Machine

A new semi-automatic threading machine designed to perform a threading and a reaming operation on 1600 to 2100 steel pieces per hour has been developed by the L. J. Kaufman Mfg. Co., Manitowoc, Wis. The pieces are loaded by hand at the front of the machine and are ejected automatically at the side.

The machine has a thirty-station revolving dial with suitable work-holding inserts or chucks designed to hold the particular part to be machined. It is equipped with three 1-inch rotating self-opening die-heads and three reamers, mounted in six individual spindles.

Individual vertical adjustment is provided for each cutting tool. Three pieces are completed at each indexing movement of the dial. The various operating mechanisms are air-controlled and interlocked for safe continuous operation. The large base has ample capacity for the coolant, which is forced to the tools by a motor-driven pump. A 3-H.P. motor drives the spindles through V-belts and the geared heads. 59

Tornos Automatic Screw Machine

The George Scherr Co., Inc., 128 Lafayette St., New York City, is placing on the market an improved Swiss automatic screw machine manufactured by Tornos, Moutier, Switzerland. This new machine is made in seven models, with spindle-bore capacities for bars from 5/32 inch up to 1 3/16 inches in diameter. The headstock of the machine travels longitudinally on the bed for a distance corresponding to the length of the work. Five simple turning tools are arranged radially around the bar stock. The stock is held in a rapidly rotating spindle in the headstock and is fed forward past the turning tools.

The tools are moved in and out by cams in turning the work to different diameters, shoulders, tapers, or in generating forms of any kind. Spindle speeds up to 12,000 R.P.M. can be used. Tool-setting is accomplished by means of patented micrometer screws on which backlash is taken up by spring pressure.

These automatic screw machines are particularly adapted for producing long thin work, fine shafts, and delicate pivots requiring great accuracy and fine finish. Accuracy limits within 0.0002 inch can be regularly maintained. All models are available with five turning tools. 60

Westinghouse Compact Photo-Electric Relay

A compact photo-electric relay which can be used for counting, sorting, weighing, measuring, signaling, and similar functions has been placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This new relay—the

To obtain additional information on equipment described on this page, see lower part of page 136.

Type RQ Photo-Troller—was especially designed with a view to obtaining low operating expense, low initial cost, and easy installation. It has two normally opened and two normally closed contacts, each rated at 10 amperes on 115-volt alternating-current circuits.

A light change of 40 foot-candles is sufficient to operate the relay if not more than 15 foot-candles of extraneous light is present. Increased sensitivity is obtained by means of a condensing lens. The unit may be mounted either on the wall or on a bench. 61

Micro Switch with Die-Cast Housing

All metal-clad Micro switches made by the Micro Switch Corporation, Freeport, Ill., can now be supplied with a new compact, streamline housing of strong die-cast metal. This housing is available with either an open or a closed top. The bottom plate can be easily removed for making connections, and the terminals will accommodate No. 14 solid wire. The hub of the housing takes a standard 1/2-inch conduit, and the wires are brought directly into the switch. 63

Giant Watson-Stillman Hydraulic Flanging Press

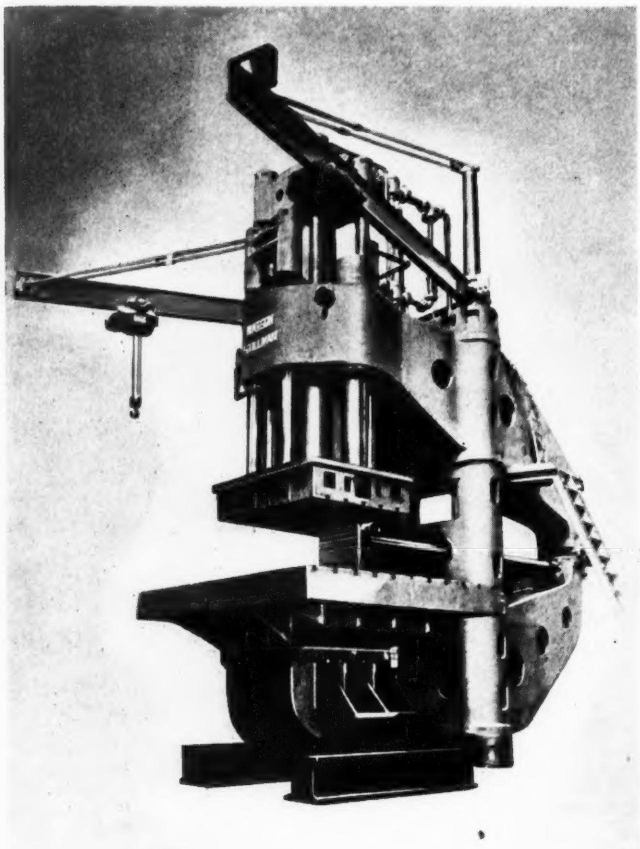
A new type of hydraulic flanging press of huge proportions has been developed by the Watson-Stillman Co., Roselle, N. J. The unique overhung gap type construction, is designed to permit the work to be readily and conveniently accessible. These hydraulic flanging presses, eight of which have already been ordered for use abroad, have a rated capacity of 1500 metric tons. It has three single-acting cylinders, one of 1000 metric tons capacity and two of 250 metric tons capacity each.

The two pull-back cylinders are of 51 metric tons capacity each, and the horizontal double-acting cylinder has a capacity of 250 metric tons. The stroke of the main cylinders is 59 inches, and that of the horizontal cylinder 6 feet 7 inches. The moving platen is approximately 8 by 6 1/2 feet, and the bottom platen is nearly 15 by 12 1/2 feet. The face of the horizontal ram measures 24 by 19 3/4 inches. 62

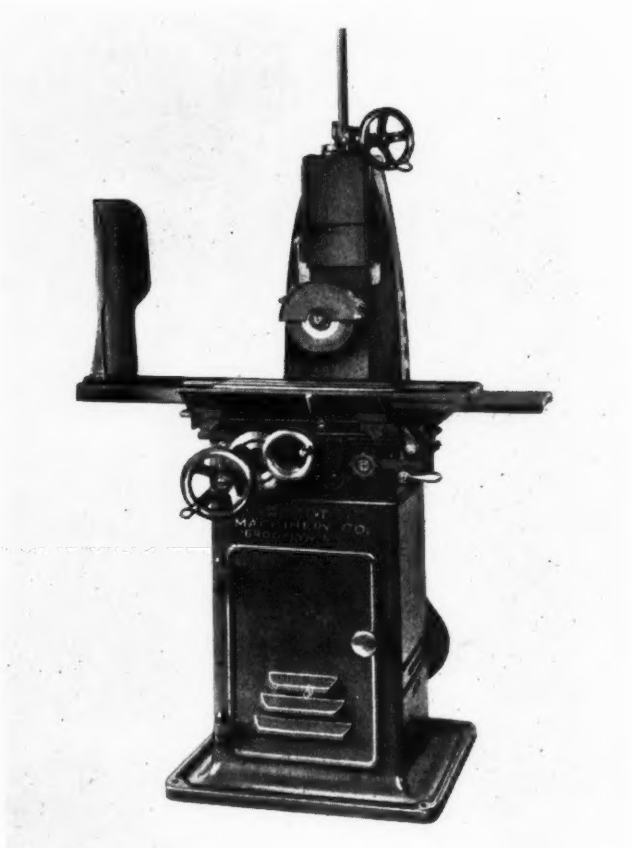
Robot Surface Grinding Machine

The precision surface grinding machine here illustrated is being placed on the market by the Robot Machinery Co., 326-340 Ten Eyck St., Brooklyn, N. Y. The machine will perform surface grinding operations on work 6 inches wide, 18 inches long, and 9 1/2 inches high. Large surfaces can be ground parallel and straight on this machine within 0.0001 inch.

The spindle is ground and lapped, and is fitted with a bronze bearing at the head end and a precision ball bearing at the rear. Adjustments can be made to compensate for wear. The table and column ways and the bearing surfaces of other parts having sliding movements are accurately machined and fitted to meet the requirements for accurate precision grinding. All slide-ways are protected by covers against the entrance of grit or other foreign matter. 64

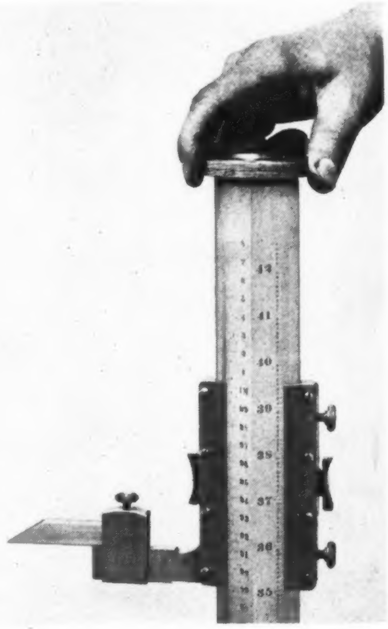


Watson-Stillman Hydraulic Flanging Press of 1500 Metric Tons Capacity

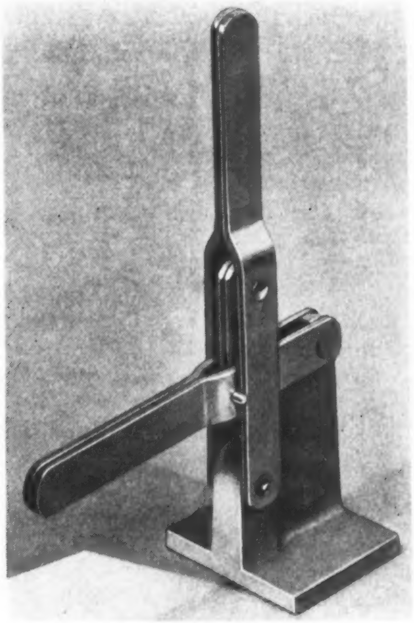


Precision Surface Grinding Machine Built by the Robot Machinery Co.

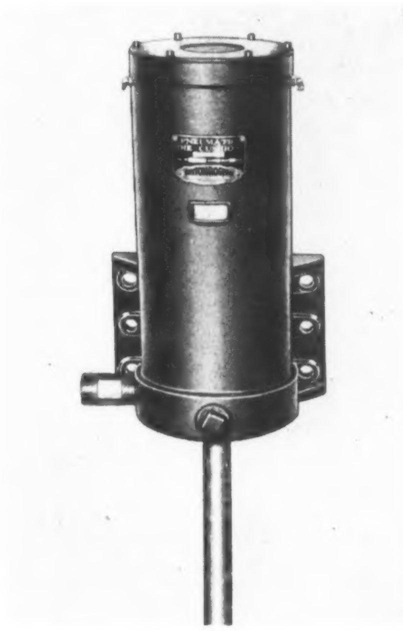
To obtain additional information on equipment described on this page, see lower part of page 136.



Chesterman Height Gage Equipped with New Fine Adjusting Knob



Toggle Clamp Manufactured by Knu-Vise Inc.



Pneumatic Counterbalancing Cylinders for Punch Presses

Chesterman 40-Inch Height Gage

The George Scherr Co., Inc., 128 Lafayette St., New York City, is placing on the market a new model of the Chesterman height gage described in April, 1937, MACHINERY, page 542. The new gage is equipped with three separate adjustments, namely, a quick-locking arrangement, a fine knurled knob at the head, and a superfine adjustment at the base. It is constructed with a triangular beam of unusual strength and rigidity, designed to prevent sway and vibration and to give accurate readings up to a height of 40 inches.

The gage is graduated in both English and metric scales to read to 0.001 inch and 0.020 millimeter. It is furnished with a large vernier scale, about 2 1/2 inches long, which enables the toolmaker or inspector to take fine measurements without the aid of magnifiers and without removing the gage from the work. Chesterman height gages are also produced in 12-, 18-, and 24-inch models. 65

Knu-Vise Toggle Clamp

A new series of toggle clamps (Type KV) has recently been added to the line of Knu-Vise Inc., 6426 Cass Ave., Detroit, Mich. These toggle clamps have several new features, the most important being the construction of the toggle bar, which is made in two halves that are spot-welded in position at assembly. The compression links pivot on the inside of the toggle bar, which, in turn, rotates on the outside of the steel base casting, which provides a large wearing surface.

All parts of the clamp are hardened and cadmium-plated, with the exception of the base, which is finished in black enamel. There are four clamps in the new series, all of which have fixed bases of T-section, with an ample clamping flange. 66

Pneumatic Counterbalancing Cylinders for Punch Presses

The Dayton Rogers Mfg. Co., Minneapolis, Minn., has developed pneumatic slide-counterbalancing cylinders of new design intended primarily for use on large presses having long strokes and heavily constructed slides and rams. These counterbalancing cylinders are designed to offset the over-riding or falling of the ram during the press cycle, and can be used singly or in multiple. Ordinarily, from two to four cylinders are used on each press.

The cylinders are now made in diameters of from 6 to 14 inches, and the strokes range from 10 to 30 inches, depending upon the press requirements. Each set of cylinders is furnished with a pneumatic regulator and gage, together with surge tank equipment. The regulator and gage are so arranged that the pressure on the cylinder piston can be increased or decreased to compensate for light or heavy slides, and to adjust the piston pressure to suit light and heavy dies.

These cylinders are operated from the regular shop air supply and can be so adjusted that the lifting or supporting capacity is equal to the weight of the die plus an ample margin for safety. In all cases, the piston travel is equal to the stroke of the press plus the adjustment of the press ram slide. The cylinders are provided with a universal mounting bracket, and can be mounted either on the crown or on the bed frame of the press. Synthetic cup packings and hard chrome piston stems are employed to eliminate rusting or pitting of the piston stem. 67

Haynes Hard-Facing Rod

A new alloy welding rod for hard-facing parts subjected to wear has been placed on the market by the Haynes Stellite Co., Unit of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York City. This new product, known as the Haynes 93 hard-facing rod, is recommended for use where severe abrasion accompanied by only a moderate amount of impact is encountered. It is adapted for use on such parts as tube-bending mandrels, dredge pump impellers, cement clinker crusher rolls, farm implements, etc.

While the new alloy rod does not have as high wear resistance as Haystellite cast tungsten-carbide

To obtain additional information on equipment described on this page, see lower part of page 136.

products or Haynes Stellite alloys, it is more wear resistant than Hascrome hard-facing alloy, but not so tough. It is of a ferrous composition and contains chromium, molybdenum, cobalt, and other alloying elements to the extent of more than 40 per cent. The tensile strength is about 43,000 pounds per square inch; the hardness, as deposited by oxy-acetylene welding, is about 62 Rockwell C. When the deposits are heat-treated by heating to 1950 degrees F. and then air-cooling, the hardness reaches 66 to 67 Rockwell C. This rod can be applied by the oxy-acetylene or the metallic arc process. 68

Baldor Improved Carbide Tool Grinder

The Baldor Electric Co., 4400 Duncan Ave., St. Louis, Mo., has developed a new carbide tool grinder which is designed to operate with a minimum amount of vibration. It has a heavier and shorter shaft than the previous grinders of this type, and the armature is so assembled that there is no end play in either direction.

This grinder is equipped with a 1/2-H.P. Baldor motor which has a speed of 3400 R.P.M. The tool-rest tables are 10 by 3 1/2 inches and are adjustable to compensate for wheel wear. The angular setting of each table is indicated by protractors mounted on the sides of the grinder. A protractor type tool-support is provided for gaging the horizontal angle of the tool. The spindle flanges are designed to accommodate either steel-backed silicon wheels or diamond wheels. 69

American Abrasive-Wheel Cutting-Off Machine

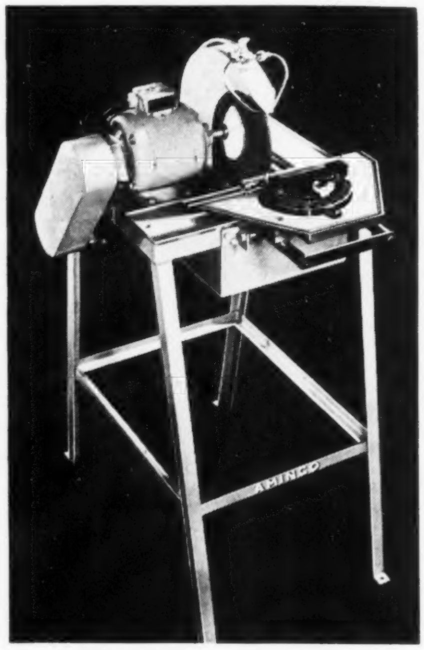
A cutting-off machine of the bonded-abrasive wheel type has just been placed on the market by the American Instrument Co., 8010 Georgia Ave., Silver Spring, Md., for cutting metals, glass, quartz, ceramics, commercial and semi-precious stones, etc., in the form of sheets, rods, tubes, and blocks. It will take cuts up to 3 1/2 inches on materials with flat surfaces. Rods, tubing, etc., up to 6 inches in thickness can be cut by rotating the material during the cutting operation.

True clean cuts can be made speedily by means of the motor-driven 12-inch rubber-bonded abrasive wheel, which has a thickness of 0.04 or 0.06 inch. Pieces as short as 1/32 inch can be cut off as easily and quickly as longer lengths.

The machine consists essentially of a non-corrosive cutting table, which can be adjusted for taking cuts at various angles; a cutting wheel direct-connected to a 115-volt, 60-cycle, alternating-current motor; and a centrifugal pump for supplying water to the wheel from a built-in pump. 70

Rome Polishing and Buffing Lathe

A Model 2MIS polishing and buffing lathe equipped with dust hoods and wheel guards, as shown in the illustration, has been brought out by the Rome Machinery Sales & Engineering Co., 627-35 Webster St., Rome, N. Y. This machine is ar-

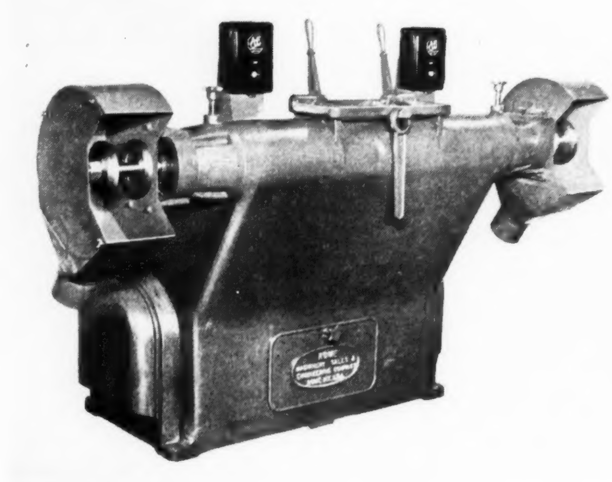


Abrasive-wheel Cutting-off Machine Made by American Instrument Co.

ranged for independent wheel operation, having two spindles and two motors. Equipment available for this machine includes taper screw points, variable-speed wheel drives, composition applicators, high-speed auxiliary wheel-spindles, and abrasive belt grinding attachments.

The accurately ground and balanced alloy-steel wheel-spindles are tapped for taper-point screws. The heavy-duty precision ball bearings are sealed against the entrance of abrasive dust and leakage of lubricant. The bronze spindle nuts are fitted to flat-top threads, and there is a spindle lock on each wheel-spindle which assists in mounting

Improved Carbide Tool Grinder Brought out by the Baldor Electric Co.



Polishing and Buffing Machine Brought out by the Rome Machinery Sales & Engineering Co.

To obtain additional information on equipment described on this page, see lower part of page 136.

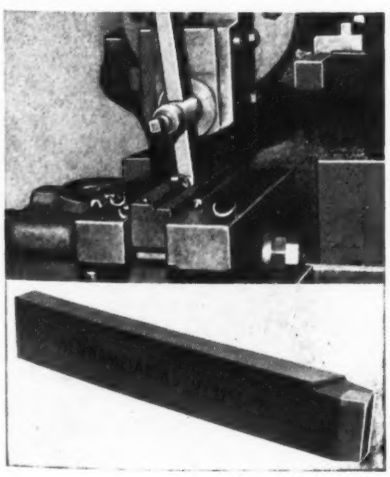
and removing the wheels. An individual lever-operated automotive type brake is provided for stopping the wheel-spindle preparatory to changing wheels. 71

Steel-Cutting Shaper Tools Tipped with Kennametal

McKenna Metals Co., 147 Lloyd Ave., Latrobe, Pa., has developed a line of standard steel-cutting shaper tools tipped with Kennametal Grade KS for machining steel of any hardness up to 550 Brinell. This is believed to be the first time that hard carbides have been regularly used on tools for shaping hardened steels.

A feature of these new tools is the unusual tool angles employed—namely, a 10-degree negative back rake, a 5-degree negative side rake, a 15-degree side cutting edge angle, and 2-degree clearances. These tool angles, which must be maintained when regrinding the tools in order to obtain the best results, are made possible by the low frictional resistance between Kennametal and the work being cut. With these tool angles, it is unnecessary to lift the tool on the return stroke. Die-blocks of 42 Rockwell C hardness may be hardened before machining with Kennametal, thus eliminating the grinding operation that would otherwise be necessary if the die-blocks were hardened after the shaping had been done.

Kennametal KS has a hardness of 76 Rockwell C and a strength of 322,000 pounds per square inch. It will take interrupted cuts without breakage, and gives long service between grinds. The tools are furnished in sizes to fit standard clapper-boxes of shapers and planers. 72



Cutting Hardened Steel with Kennametal-tipped Shaper Tool

Bijur Hydraulically Operated Lubricators

The Bijur Lubricating Corporation, 43-01 22nd St., Long Island City, N. Y., has brought out a new type of automatic lubricator that is hydraulically operated and has no mechanical drive connection with the machine. A small tube, 5/32 inch outside diameter, connected with the hydraulic system serves to operate the lubricator. This arrangement has the advantage that it permits the lubricator pump to be located at any convenient point, as its operation does not depend on a rotating shaft or other mechanical part.

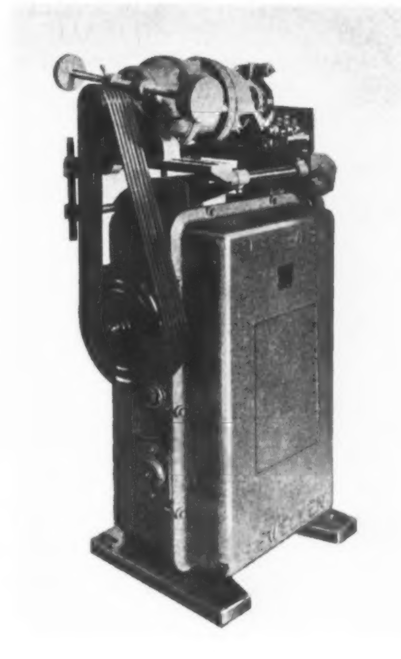
The hydraulic lubricator pumps shown in the illustration are of two distinct forms, one being arranged for mounting on a standard 2-pint or 6-pint oil reservoir, while the other is particularly adapted for mounting in a reservoir cast integral with the machine.

Bijur Automatic Lubricators Operated by Hydraulic System

In a typical installation, a single tubing line leads from the lubricator pump to a distributing system of small tubes that carry the oil to the various bearings. At or near each bearing is introduced a meter unit. These units control the oil feed according to the individual needs of the bearings. 73

Lewellen Variable-Speed Transmission for Winding Strip Metal

The Lewellen Mfg. Co., 1015 E. 10th St., Columbus, Ind., has recently brought out a variable-speed transmission with electrical controls for maintaining uniform tension in winding strip metal. This equipment has been designed for fully automatic operation. The winding reel starts at its highest speed, and as the strip material is wound on the spool, increasing the diameter, the control accurately reduces the speed of the reel to maintain uniform tension on the strip.



Lewellen Variable-speed Transmission for Winding Strip Metal

After the reel has been filled and the unit stopped for removing and replacing it with a new core, the control reverses its position to allow the new reel to start again at the maximum speed. 74

Ideal Coil Winder Drive

A Model 210 coil winder drive built for accurate and uniform winding of various types of coils has been brought out by the Ideal Commutator Dresser Co., 1011 Park Ave., Sycamore, Ill. This winder automatically maintains a constant tension on the wire. The transmission gives an infinite number of driving speeds between 120 and 650 R.P.M. The exact speed for each job is easily obtained through the large foot-pedal, which operates a cone type combination brake and clutch. This arrangement makes it possible to obtain any speed from zero up to that for which the "Select-O-Speed" unit is set. As the operator's foot is removed from the pedal, the spring-actuated brake automatically stops the machine. There is also a neutral position which allows the machine to be turned by hand.

To obtain additional information on equipment described on this page, see lower part of page 136.

An automatic revolution counter records every turn of the machine, and a pilot light on the front of the cabinet indicates when the 1/3-H.P. motor is running. The coil winder drive is 48 inches high by 24 inches wide by 18 inches deep, and weighs approximately 180 pounds. 75

Thor Portable Electric Nibbler for Cutting Sheet Metal

A small portable electric nibbler for cutting all kinds of sheet metal has just been placed on the market by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. This portable tool is only 9 inches long and weighs but 3 3/4 pounds. It has a yoke type front head equipped with a punch and die that nibbles out a rectangular shaving of metal at each upward stroke of the punch. It will cut sheet steel up to 18 gage, or 0.049 inch in thickness, and sheet aluminum in thicknesses up to 15 gage, or 0.072 inch.

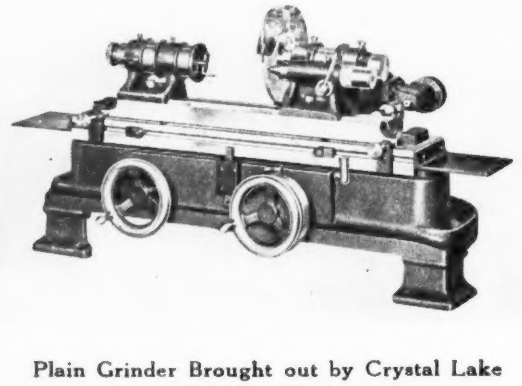
The nibbler will cut wide strips without distorting or curling the sheet material, even if it is corrugated or has a curved outline. Internal cuts of any shape can be taken by inserting the head of the tool in a hole 1 inch in diameter punched in the sheet material. Curves and circles having a radius as small as 1 inch can be cut, and shapes can be cut from tubing as small as 1 1/2 inches in diameter. 76

Crystal Lake Plain Grinder

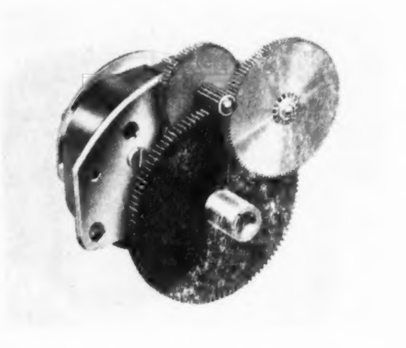
The Crystal Lake Machine Works, Crystal Lake, Ill., has just brought out a plain grinder equipped with a wheel-head having a micrometer stop that provides for accurate grinding to size, regardless of the pressure put on the feed-wheel. The dial on the feed-wheel reads directly to 0.0001 inch. A spindle speed of 3200 R.P.M. is available, and there are four work speeds. The grinder takes a wheel 6 inches in diameter with a 7/8-inch spindle hole and face widths of from 1/16 to 3/8 inch.

The table travel feed is triple-geared to give a movement of 1/2 inch to one turn of the hand-wheel. A very sensitive adjustment of the platen for taper-grinding is provided. The platen swivels 7 degrees each way on a hardened and ground center pin. The feed dial reads to 0.0005 inch.

The platen is made with one vee and one flat way to insure perfect alignment of the head and tailstock. The lapped, hardened and ground, tool-steel tailstock spindle has spring tension adjustment. The lapped, hardened and ground headstock spindle has a cone type front bearing on bronze bushings. 77



Plain Grinder Brought out by Crystal Lake Machine Works

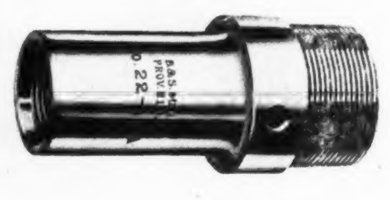


Barber-Colman Geared-head Motor with Gear Ratio of 269 to 1

Barber-Colman Geared-Head Motors

The Barcol shaded-pole induction motors of 0.0028 to 0.018 H.P., made by the Barber-Colman Co., Rockford, Ill., are now available in geared-head open type reduction models. Three gear ratios, 36 to 1, 54 to 1, and 269 to 1, are supplied for these motors, providing output shaft speeds of 80, 54, and 11 R.P.M.

Several different outputs are provided for each speed, depending on the size and duty cycle of the motor. Cut gears are employed, a Textolite gear being used on the first step to reduce noise. 78



Feeding Finger Adapter for Brown & Sharpe Automatic Screw Machines

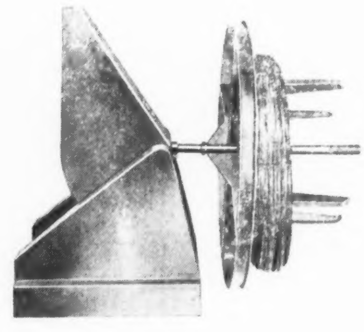
Brown & Sharpe Feeding Finger Adapters for Automatic Screw Machines

The Brown & Sharpe Mfg. Co., Providence, R. I., has developed a line of feeding finger adapters which make it possible to use the same feeding finger on several sizes of Brown & Sharpe screw machines. This development materially reduces the number of feeding fingers required, and has the advantage that it permits smaller fingers to be used for small work.

These adapters are threaded on each end, as shown in the accompanying illustration. One end screws into the end of the feeding tube and the other is threaded to fit the feeding finger. 79

Moslo "Shiftweight" Wire Reel

A wire reel known as the "Shiftweight," which is designed to enable one man to easily place a 300-pound wire coil on the reel in a vertical position, as shown in the illustration, and then swing the coil into a horizontal position, is being placed on the market by Moslo Machinery, Inc., 5005 Euclid Ave., Cleveland, Ohio. The shifting counterpoise used on this reel is so designed that, regardless



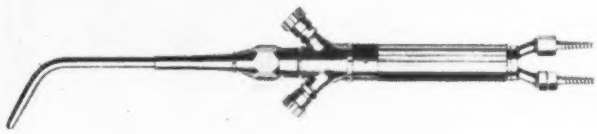
Moslo Wire Reel which can be Easily Tilted to a Horizontal Position

To obtain additional information on equipment described on this page, see lower part of page 136.

of the position of the wire coil, the countering weight always assumes its most effective position.

The locking latch is controlled by a knurled spindle which passes through the center of the reel. After the reel is loaded, the operator simply releases the locking mechanism and places the coil in the feeding position. A simple upper ring keeps the coil in position, and an adjustable friction brake prevents over-runs, maintaining the proper tension on the wire feed at all times.

The reel is capable of handling coils having a minimum inside diameter of 10 inches, and the reel arms can be adjusted to the outside diameter of the ring, which is 42 inches. The shipping weight of the reel, including ballast, is approximately 500 pounds. 80



Oxweld Blowpipe Designed for Welding Light-gage Metal

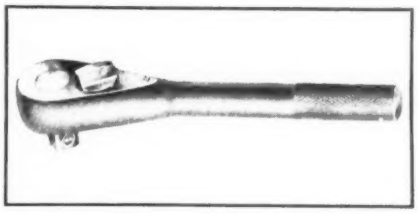
Buffing and Polishing Lathe

A new lathe for buffing and polishing metals has been developed by the Hanson-Van Winkle-Munning Co., Matawan, N. J. This lathe (Type MI) is of rugged construction designed to eliminate vibration and assure smooth performance. The spindle is equipped with pressure ball bearings of over-size capacity, lubricated by an oil reservoir.

The spindle has a 12-inch overhang to provide work clearance, and is driven through high-speed V-belts, which can be changed quickly without disturbing the spindle bearings or alignment. The spindle speeds range from 1800 to 3600 R.P.M. Other speeds can be obtained by changing the motor pulley. The tension on the V-belt can be adjusted by means of a handwheel. An automotive type brake is provided which permits the spindle to be brought to a quick stop for changing wheels. There is also a positive lock for the spindle.

The machine is made in 3, 5, 7 1/2, and 10 H.P. sizes, with bases 26 inches wide by 24 inches deep. The weights range from 1265 to 1540 pounds. The lathe is furnished for operation on 220-, 440-, and 550-volt, two- or three-phase, 60-cycle, alternating-current circuits, and can also be supplied for other alternating- or direct-current circuits. 81

Hanson-Van Winkle-Munning Buffing and Polishing Lathe



Armstrong Miniature Ratchet Wrench

Armstrong Miniature Reversible Ratchet Wrench

Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago, Ill., has recently brought out a miniature reversible ratchet wrench and four new drivers for the miniature detachable-head wrenches made by the company. The reversible ratchet wrench, which is only 4 inches long, is machined from special chrome-vanadium steel and finished in chrome plate. The ratchet is of improved design with hardened gear and instant-reversing thumb switch.

The other four additions to this series of drivers include a flexible head handle; a screwdriver type extension spin-grip, which permits locking the head so that it can be used as a spinning extension; and long and short extensions. 82

Oxweld Blowpipe Designed for Light Welding

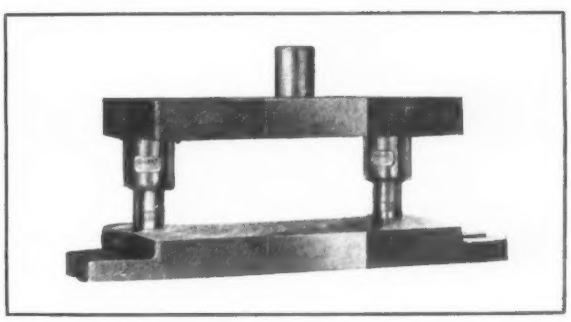
A new oxy-acetylene welding blow-pipe designed for welding light-gage metal has been placed on the market by The Linde Air Products Co., Unit of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York City. Although this welding blowpipe, known as the Oxweld Type W-29, is especially designed for welding operations on light production work and in aircraft construction, its field of usefulness extends to all applications in which metals up to 3/8 inch thick are to be joined.

Its light weight, of only 15 ounces, small size, and slender lines make it well suited for welding in relatively inaccessible places, as well as for production work. Both valves are located where they can be readily adjusted by thumb and forefinger.

The features of this blowpipe include packless valves and valve-stems shielded against knocks; increased flash-back resistance; large valve capacity; and small-size screw type hose connections on the blowpipe handle which permit the use of 3/16-inch hose for full blowpipe capacity. There are eight welding heads, each with a built-in injector and each available in both the one-piece tip and the two-piece tip style. Either low- or medium-pressure acetylene can be used. 83

Danly Safety Guide-Post Covers

Danly Machine Specialties, Inc., 2112 S. 52nd Ave., Chicago, Ill., has placed on the market a line of safety guide-post covers for use on punch press dies where the die bushings



Die Set Equipped with Danly Safety Guide-post Covers

To obtain additional information on equipment described on this page, see lower part of page 136.

are carried out of contact with the guide posts and thus form gaps that are a source of danger. The guide-post covers completely enclose the gaps, so that nothing can enter, thus protecting the operator against injury to fingers, hands, or arms. The damaging of a die, die set, or the press itself through carelessness in allowing stock to be caught between the bushing and the guide post is also prevented by the guide-post covers.

The covers are made with inside diameters ranging from 1 1/8 up to 4 7/8 inches. Telescoping covers are made for use where a single cover will not close the gap or where it is desired to completely enclose the guide posts and bushings to protect them from damage. The top units are made in lengths of 1 inch and over. The covers are attached to the die by spring clips, which permits them to be removed or locked in place by a simple twist of the wrist, as indicated in the illustration. Oilers have been developed for the top units of the safety guide-post covers to provide proper lubrication for the guide posts. 84

Link-Belt Variable-Speed Transmission with Vernier Control

The Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa., has brought out a vernier control which can be applied to all sizes of their P.I.V. gear variable-speed transmissions for installations requiring extremely fine control of the speed changes. This vernier control can be supplied with either a 7 1/2-to-1 or a 30-to-1 ratio. It is equipped with two handwheels, one for direct control and the other for secondary or vernier control. The latter wheel requires either thirty turns or seven and one-half turns to one turn of the direct control wheel, depending upon the ratio of the worm-gear furnished.

The vernier control provides the fine sensitivity required for true micrometer adjustments of speed, and is particularly recommended for use in synchronizing the speeds of two machines; compensating for shrinkage and expansion in such products as textiles and paper; and controlling feeders of various kinds and wire covering machinery or any machines requiring close speed regulation. 85

Vernier-controlled Variable-speed Transmission

Hammond Low-base Polishing and Buffing Machine

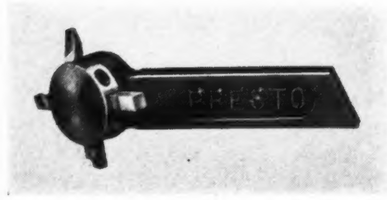
Hammond Low-Base Polishing and Buffing Lathe

The Hammond Machinery Builders, 1619 Douglas Ave., Kalamazoo, Mich., have recently added to their line of "Rite-Speed" and "Vari-Speed" polishing and buffing lathes a new model designated the "3-RR 27-inch Low Base." This is a two-spindle machine, each spindle being independent of the other and having its own magnetic starter, control switch, brake, and motor. The standard lathe measures 63 inches from one end of the spindle to the other, and is equipped with two 3-H.P. motors.

The unusual feature of this machine is the low-base construction, the distance from the center of the spindle to the floor line being only 27 inches, which makes the machine especially desirable for use in the production of cutlery or for any application where it is an advantage for the operator to work in a sitting position. 86

Presto Turret Type Tool-Holder

The Presto Mfg. Co., 518 Newport Ave., N., Detroit, Mich., has brought out a tool-holder of the turret type which holds four 3/8-inch tool bits. The shank of this tool can be gripped in the lathe toolpost in the conventional manner, and any one of the four tools brought into the cutting position.



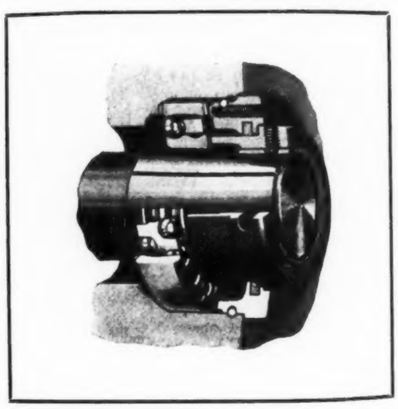
Presto Turret Type Tool-holder

The indexing of a tool to the cutting position is accomplished by releasing the nut at the back of the tool-holder and turning the turret clockwise until the desired tool snaps into position. The clamping nut is then tightened, causing the turret to be held securely against the locking device. 87

Simplex Ball-Bearing Units for Machine Applications

The Ahlberg Bearing Co., 3052 W. 47th St., Chicago, Ill., has developed a line of machine bearing units known as the "CJB Simplex." The units are designed to provide machine manufacturers with a simple and economical means of incorporating ball bearings in their equipment where the bearing housings are integral parts of the machine.

These bearing units are available in three capacities adapted for light, medium, and heavy loads, with either single-row, double-row, or self-aligning bearings. In the light series, the bearings are mounted directly on the shaft, whereas the medium and heavy units have a split adapter sleeve in a tapered bore bearing.



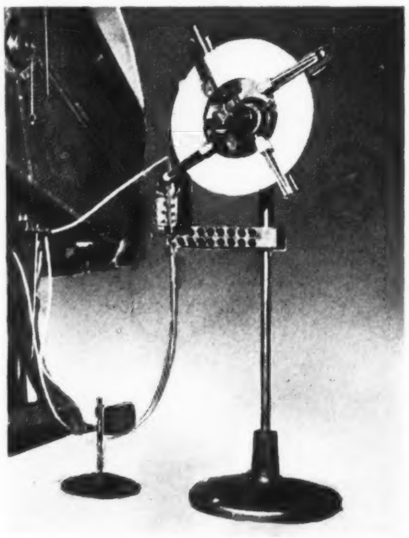
Simplex Ball-bearing Unit Made by Ahlberg Bearing Co.

To obtain additional information on equipment described on this page, see lower part of page 136.

Retaining caps are available for either the open or closed types, and units can be furnished in either the expansion or non-expansion types. A new non-drag seal employing Neoprene as the sealing material, which provides a frictionless labyrinth type seal, effectively prevents the entrance of dirt or other harmful substances. 88

Simplex Automatic Stock Reel

An automatic stock reel operated by a solenoid that actuates a pawl lever has been developed by J. A. Honegger, 223 Spruce St., Bloomfield, N. J., for use on punch presses. The electrically actuated pawl lever engages a ratchet wheel attached to the reel proper, and thus imparts the required feeding or rotating movement to the stock reel. The pawl arm is returned to its original position by a spring after each feeding movement. Over-run of the stock reel is



Simplex Stock Reel Applied to Press Equipped with Twelve-station Cut-and-carry Die

prevented by the usual friction washers.

The sensitive actuating mechanism of the switch that controls the solenoid is shown on a separate base in the illustration, although it can be mounted directly on the reel stand. The reel will handle coils up to 200 pounds satisfactorily, and with a suitable solenoid, it can handle coils up to 300 pounds. Test reels, like the one shown, have been in operation sixteen hours a day for the last six months. 89

Link-Belt "Easy Chain Detacher"

"Easy Chain Detacher" for Steel Link-Belt

The Link-Belt Co., Indianapolis, Ind., has developed a new tool known as the "Easy Chain Detacher," which is designed to facilitate the detaching and assembling of steel link-belt. With this tool, the chain links can be easily brought into the proper position for assembling. This can be done with one hand while using a hammer with the other. The detacher is of sufficient weight to permit it to serve as a backing against which to knock the chain apart. The tool is made of Promal. It is designed to accommodate all sizes of steel link-belt, and weighs 3 1/4 pounds. 90

Light-Weight Corrosion-Resisting Electric Hoist

Electro Lift, Inc., 30 Church St., New York City, has brought out a new light-weight high-speed cable type electric hoist having all castings made of an aluminum alloy. This hoist has been designed to obtain the lightest possible weight consistent with the service for which it is intended. It is especially suitable for applications requiring frequent moving and handling. The non-corrosive properties of the aluminum adapt the hoist for use where steam and acid fumes are encountered.

This hoist is built in sizes ranging from 1/8 ton to 3 tons, and has all the speeds and ratings of standard Electro Lift hoists. The control may be either of the rope or push-button type. Top and bottom limit switches can be provided for stopping the load in each direction of travel to prevent running the cable off the drum and to provide an accurate stop at the bottom as well as at the top of the lifting range. 91

* * *

The first steam fire engine was built by John Ericsson in the year 1830, according to *The Inventor*.

Production and Use of Ledloy Abroad

The production and use of Ledloy, a lead-bearing open-hearth steel introduced by the Inland Steel Co., Chicago, Ill., in 1937, is constantly increasing abroad. In England, several steel companies have been licensed to produce this free-cutting steel, and it is being stocked extensively by leading warehouses in the British Empire. In fact, the demand for Ledloy has grown so rapidly that certain British interests have formed a new company Ledloy, Ltd., which will coordinate the production and distribution of this steel and will furnish technical advice to producers and consumers. This company will also direct the production of Ledloy in India. Other licenses have recently been granted to steel producers in France and Sweden, while in Holland, Switzerland, and other non steel-producing countries, this steel is being regularly warehoused.

Ledloy is the Inland Steel Co.'s copyrighted name for steel of any type containing a small percentage of lead dispersed uniformly throughout the steel. Both the product and the process for making Ledloy are protected by patents here and abroad. The advantage claimed for Ledloy is its free-machining quality, permitting from 50 to 200 per cent faster cutting speeds and up to 300 per cent longer tool life.

* * *

Precision Gage Sales Show Increased Activity

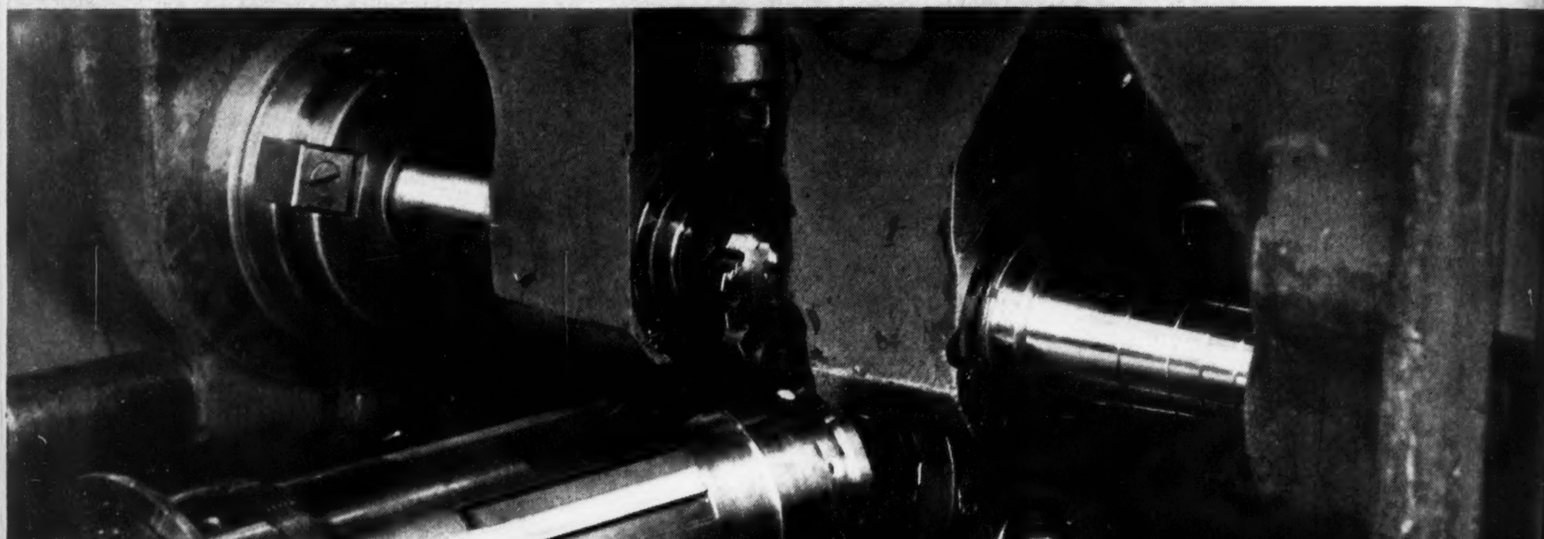
Sales of Johansson gage-blocks during recent months have reached the highest point since May, 1929, according to the Johansson Division of the Ford Motor Co. The increased sales of precision gages not only indicate satisfactory present industrial activity, but point to confidence in its continuation.

* * *

Marked Upturn in Electrical Business

Orders received by the General Electric Co., Schenectady, N. Y., during the fourth quarter of 1939 amounted to over \$112,000,000, compared with \$63,400,000 in the last quarter of 1938. The orders for the whole year of 1939 amounted to over \$360,000,000, compared with \$252,000,000 for 1938.

To obtain additional information on equipment described on this page, see lower part of page 136.



Above—**Typical production set-up on No. 10.** Climb milling permits double fixture milling using only one cutter and without reversing the spindle.

Left—**Climb Milling Splines on No. 12.** Each spline milled in a single cut from the solid. Climb milling permits fast, heavy cut with unusual accuracy and finish.

—Another MODERN feature of the Brown & Sharpe *Electrically Controlled* Nos. 10 and 12 Plain Milling Machines . . . the Backlash Eliminator —permits the full advantages of climb milling, especially on work difficult to hold—as well as allowing increased feeds with better finish and longer cutter life.

Investigate the advantages of these profitable machines for Your work. Write for complete details, Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

BS

SHARPE

NEWS OF THE INDUSTRY

California

Harold Swanton has been elected vice-president of Precision Bearings, Inc., Los Angeles, Calif., succeeding Norman Bell. Mr. Swanton, who has been sales manager for several years, will continue in that capacity, in addition to filling his new duties as vice-president. He has been identified with the company and its predecessors for about fifteen years and has a wide acquaintance throughout the manufacturing and service fields on the Pacific Coast and in the far western states.

Illinois and Indiana

John I. Yellott has been appointed professor and director of mechanical engineering at Armour Institute of Technology, Chicago, Ill. The appointment will become effective on September 1, 1940, when the Illinois Institute of Technology (the new engineering school brought about by the merger of Armour and Lewis Institute) will be opened. Mr. Yellott was previously connected with Stevens Institute of Technology, and will take the position previously held by Professor P. C. Huntly, who is now head of the civil engineering department.

D. C. Peterson has been appointed plant manager in charge of all manufacturing operations for the Buda Co., Harvey, Ill. He succeeds E. D. Conant, who recently resigned from the position of vice-president in charge of manufacturing. Mr. Peterson has been associated with the Continental Can Co. for the last five years. He was previously connected with the Buda Co. for a period of sixteen years, serving as electrical engineer, plant engineer, and general superintendent of production.

D. C. Peterson, Plant Manager in Charge of All Manufacturing Operations for the Buda Co.

F. H. Fowler, president and general manager of Foote Bros. Gear & Machine Corporation, Chicago, Ill., has resigned to become assistant to the president and chief operating executive of the American Machine & Metals, Inc., Moline, Ill. Mr. Fowler will continue to serve as director and chairman of the executive committee of Foote Bros. Gear & Machine Corporation. W. A. Barr, vice-president in charge of manufacturing of Foote Bros., has been elected executive vice-president and general manager.

William W. Blomberg has become associated with the Moline Tool Co., Moline, Ill., as factory representative and engineer. For the last twenty-four years, Mr. Blomberg has been connected with the Rockford Drilling Machine Co., now a division of the Borg-Warner Corporation, in a similar capacity. The Moline Tool Co. recently acquired the machine tool business of the Rockford concern.

H. J. Braun has recently been placed in charge of sales of the Steel Specialties Division of the Foote Bros. Gear & Machine Corporation, Chicago, Ill., covering "Five-point Deep Hard" steel products and precision gearing. Mr. Braun replaces H. G. Hobbs.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., have recently become distributors of McKay "Certified" stainless steel electrodes. These electrodes will be carried by all the Ryerson branches.

Charles L. Bennett has been appointed western sales manager for Designers for Industry, Inc., with headquarters in Suite 984, Merchandise Mart, Chicago, Ill.

Arthur R. Tinnerholm has been appointed product engineer of the Fort Wayne, Ind., plant of the General Electric Co.'s Plastics Department.

Michigan

Micromatic Hone Corporation, manufacturer of honing machine tools, has recently leased additional space at 1349 E. Milwaukee St., Detroit, Mich., which will practically double the space formerly occupied. Additions of machinery have further substantially increased the production capacity. As a result of the expansion of some departments, new office space has been occupied at 1351 E. Milwaukee St., where the purchasing, factory superintendent's, export sales, and advertising offices will be located.

Square D Co., Detroit, Mich., has bought the Kollsman Instrument Co., manufacturer of precision instruments for the aviation industry. The Square D Co. has specialized in motor control and switch equipment in the electrical field, and will now include in its line the products previously made by the Kollsman Instrument Co. The Kollsman organization will remain intact and will continue at the plant in Elmhurst, N. Y. Paul Kollsman will continue with the Square D Co. as a consultant.

D. F. McCandlish, formerly manager of the Oklahoma City district for the Air Reduction Sales Co., 60 E. 42nd St., New York City, has been appointed manager of the Detroit district, with headquarters at 7991 Hartwick St., Detroit, Mich. C. J. Dekker, previously assistant manager of the Detroit district, will take Mr. McCandlish's place as manager of the Oklahoma City district.

Agerstrand Corporation, Muskegon, Mich., commercial heat-treaters and manufacturers of tools, dies, and light machinery, are doubling their present plant at 1823 Commerce St.

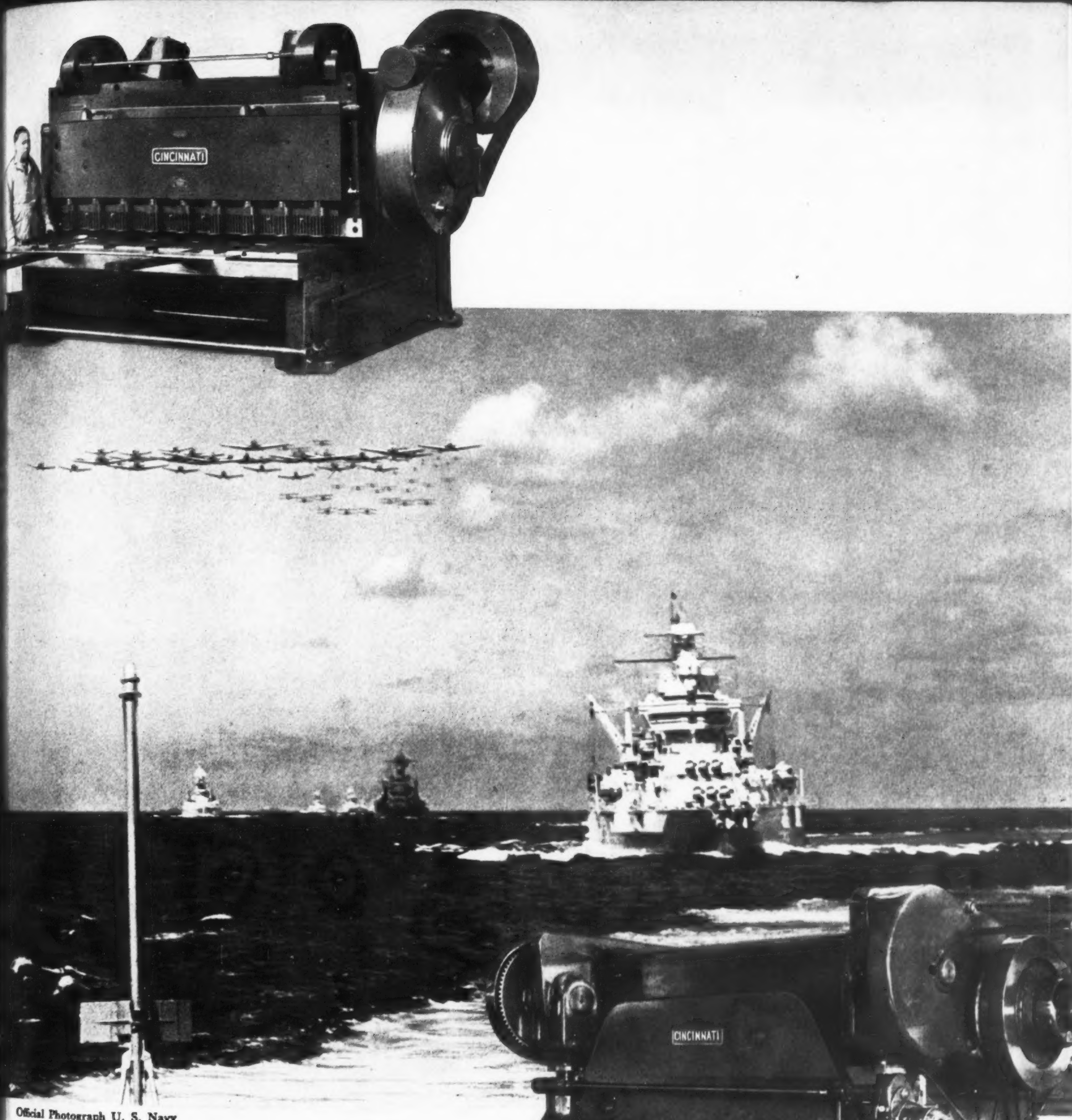
Landis Tool Co., Waynesboro, Pa., announces that the Detroit office of the company is now located at 420 New Center Bldg., Detroit, Mich.

New England

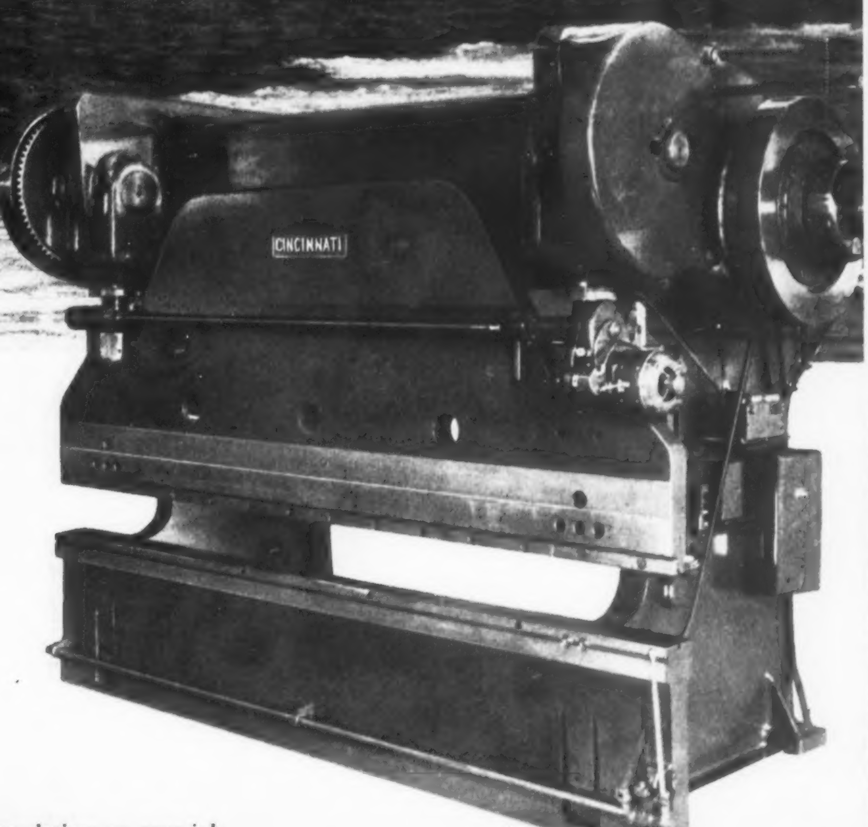
W. Beltran duMont was made vice-president and director of the Threadwell Tap & Die Co., Greenfield, Mass., at a recent stockholders' meeting. Mr. duMont has had twenty-seven years of experience in the small tool business, and was formerly vice-president in charge of sales of the Greenfield Tap & Die Corporation. Other new directors elected are: Philip Rogers, president of the Millers Falls Co.; and George C. Lunt, treasurer of the Rogers, Lunt & Bowlen Co.

W. D. Haylon, who for more than four years has been publicity representative for the Pittsfield, Mass., Works of the General Electric Co., has been appointed advertising manager of the General Electric Plastics Department, with headquarters at Pittsfield. Mr. Haylon succeeds N. S. Stoddard, who has resigned.

C. O. Drayton, general sales manager of the American Screw Co., Providence,



Official Photograph U. S. Navy



R. I., spoke January 23 before the Advertising Club of Boston, Mass., on the two-year advertising and merchandising campaign that has been carried on to promote the sales of Phillips recessed-head screws. The advertising campaign discussed recently won First Award in the Fabricating Parts Class at the National Industrial Advertisers' Association's convention in New York City.

THOMAS M. PURTELL has been made district manager of sales for the Wyckoff Drawn Steel Co. in the Connecticut territory. Mr. Purtell's headquarters will be at 125 Trumbull St., Hartford, Conn.

LEO C. PELKUS is now representing the Ajax Electric Co., Inc., Frankford Ave. and Allen St., Philadelphia, Pa., in the states of Maine, Vermont, Massachusetts, Rhode Island, and New Hampshire.

New York and New Jersey

NILES-BEMENT-POND CO., 117 Liberty St., New York City, at its annual meeting on December 23, elected the following new directors: CHARLES W. DEEDS, president of the Chandler-Evans Corporation, Meriden, Conn.; HUBERT D. TANNER, vice-president of the Niles-Bement-Pond Co.; and CHARLES M. POND, vice-president of the Niles-Bement-Pond Co. Mr. Tanner and Mr. Pond were elected vice-presidents a year ago. Mr. Tanner has been with the company twenty years, and is in charge of the Machinery Division. Mr. Pond has been associated with the company thirty-one years, and is in charge of the Small Tool and Gage Division.

DAVID K. MILLER has been appointed manager of the Baltimore branch of the Crucible Steel Co. of America at 1007-1008 Court Square Bldg., Baltimore. Since 1937, Mr. Miller has been district representative at Baltimore. J. S. BILLINGSLEY has been appointed assistant manager of the Pittsburgh branch of the company in the Oliver Bldg. GEORGE SHARPE recently joined the organization, and will specialize on the sales and promotion of Rexalloy, a recently introduced non-ferrous, cast cutting alloy.

David K. Miller, Manager of the Baltimore Branch of the Crucible Steel Co. of America

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa., has recently acquired six and a half acres of land on River Road, Buffalo, N. Y., where it intends to erect new buildings immediately. These buildings will house new equipment to supplement the company's electric steel melting furnace devoted exclusively to the making of stainless-steel castings. It is stated that approximately 150 additional men will be employed.

H. W. COLLINSON, who for many years has been district sales manager in the Cleveland industrial territory for the Carborundum Co., Niagara Falls, N. Y., has been transferred to the position of district sales manager at Chicago, Ill., which was formerly held by F. E. GRIDLEY. E. F. KONKER will succeed Mr. Collinson at Cleveland.

VICTOR BROOK, 433 Rockingham St., Rochester, N. Y., has been made exclusive representative in the up-state New York area, from Jamestown to Schenectady, of the Van Keuren Co., Watertown, Boston, Mass., manufacturer of precision measuring tools.

BERTRAM M. AINESWORTH, who has been associated with Designers for Industry, Inc., 630 Fifth Ave., New York City, as merchandising counsel, has been appointed eastern sales manager. He will continue as head of the Merchandising Counsel Division.

DR. A. LLOYD TAYLOR, for six years director of the Department of Chemistry of the Pease Laboratories, New York City, has joined the technical staff of Oakite Products, Inc., 22 Thames St., New York City, manufacturer of industrial cleaning materials.

ROBERT A. JONES has been appointed district engineer of the New York district of the General Electric Co., Schenectady, N. Y. He was previously assistant engineer of that district, in which position he is succeeded by W. S. HILL.

DR. WILLIAM A. MUDGE has joined the Technical Service Division of the New York office of the International Nickel Co., Inc., 67 Wall St., New York City.

ARTHUR NUTT, vice-president for engineering of the Wright Aeronautical Corporation, Paterson, N. J., was elected president for 1940 of the Society of Automotive Engineers at the business session of the Society's annual meeting, held in Detroit the week of January 15. Mr. Nutt succeeds WILLIAM J. DAVIDSON, of General Motors Corporation, who will continue as a member of the S A E Council. DAVID BEECROFT, of the Bendix Products Division of the Bendix Aviation Corporation, who has served seven consecutive terms as treasurer of the Society, will continue to fill that position.

Ohio

W. B. MOORE, who has been associated for about twenty years with the Timken Roller Bearing Co., Canton, Ohio, in various sales activities, has been appointed director of sales of the Steel and Tube Division. The position of manager of industrial sales, which Mr. Moore previously held, will be filled by S. C. PARTRIDGE, assistant manager of industrial sales. C. H. MCCOLLAM, metallurgist of the Steel and Tube Division, has been appointed assistant director of steel sales.

JAMES F. LINCOLN, president of the Lincoln Electric Co., Cleveland, Ohio, is making an extensive speaking tour throughout the South, southwestern, and western parts of the country, during which he will address executive, engineering, and industrial groups. His itinerary includes twelve cities. On January 11, he addressed the Charlotte Engineers Club of Charlotte, N. C., on the subject "Government is Made for Man, Not Man for Government."

TINNERMAN PRODUCTS, INC., Cleveland, Ohio, has been organized for the manufacture of speed nuts and speed clips. The officers of the new corporation are ALBERT H. TINNERMAN, president and treasurer, and GEORGE A. TINNERMAN, vice-president and general manager.

GEORGE W. PLAISTED, vice-president of the Austin Co., in charge of West Coast operations for the last seven years, has been made vice-president and general sales manager of the company, with headquarters at Cleveland, Ohio.

Pennsylvania

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., recently gave a luncheon in honor of thirty-six employes who have received special recognition in the last six months for their suggestions, numbering more than 780, for improving the company's operations and productions. Eighteen of the men have received awards of $25 for outstanding suggestions, and the rest have received additional awards for contributing thirty-five or more suggestions since the inauguration of the suggestion system by the company in 1910. During the last twenty-nine years nearly

60,000 suggestions have been made by employes in the various divisions of the company, approximately 35 per cent of which have been accepted by the suggestion committee. More than $14,000 was awarded for suggestions received during the first half of this year alone.

R. A. CANNON, previously vice-president in charge of casting sales of the Birdsboro Steel Foundry and Machine Co., Reading, Pa., has been made vice-president in charge of sales, in which position he will be responsible for the entire sales activities of the company.

R. A. Cannon, Vice-president in Charge of Sales of Birdsboro Steel Foundry and Machine Co.

GEORGE W. HOOVER has been appointed export sales manager of the Duff-Norton Mfg. Co., 2710 Preble Ave., Pittsburgh, Pa., manufacturer of lifting jacks. Mr. Hoover's headquarters will be at 30 Church St., New York.

Wisconsin

GARDNER MACHINE CO., Beloit, Wis., at a recent meeting of the board of directors, elected the following officers: Chairman of the board, L. WALDO THOMPSON; president, WALTER B. LEISHMAN; vice-presidents, INGLE R. SHUE and ROBERT W. ROTH; and secretary and treasurer, C. WINSLOW THOMPSON. Mr. L. Waldo Thompson has rounded out thirty years of active management of the company, having become connected with the corporation when it was organized in 1909. In 1914, he was elected president.

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis., has recently completed a distribution transformer plant at Pittsburgh, which will be known as the River Plant of the Pittsburgh Works. This transformer plant is said to be the only one in the world that is laid out and set up for modern line production operation throughout.

JAMES TATE, director of sales of the Delta Mfg. Co., Milwaukee, Wis., has been elected a vice-president. ROBERT P. MELIUS has been appointed general sales manager and ROBERT C. BECK, assistant sales manager. In addition, FREDERICK W. VORCK has been made sales manager of the Eastern Division, and JACK MATHER sales manager of the Western Division.

FRED E. HAKER has been advanced from the position of assistant manager of purchases to general manager of purchases of the Allis-Chalmers Mfg. Co., Milwaukee, Wis.

NEW BOOKS AND PUBLICATIONS

PRINCIPLES OF INDUSTRIAL MANAGEMENT FOR ENGINEERS. By L. P. Alford. 531 pages, 6 by 9 inches. Published by the Ronald Press Co., 15 E. 26th St., New York City. Price, $4.50.

This book has been written to meet the need for an orderly, logical presentation and interpretation of the teachings of management as related to the present period of economic and industrial transition. The text has been prepared with a view to being suitable for use in courses in administration and management as given in the engineering colleges.

The first four chapters of the book deal with the evolution of industry and of management in industry. Chapters 5 to 12 present the theory of organization and standards for the function of control. Chapters 13 to 18 deal with the several aspects of the control of materials in manufacturing, including purchasing, inventory, stores, production planning and control, and inspection. Chapter 19 presents the fundamentals of time standards as determined by time and motion study. Chapter 20 deals with classification and symbolization, and serves to introduce the subject of cost accounting to which the three following chapters are devoted. The remaining chapters deal with maintenance of buildings and machinery; rate setting; wage payment plans; employer-employe relations; industrial safety; measures of administrative and managerial performance; and administration and management research.

CAST METALS HANDBOOK (1940 Edition). 504 pages, 6 by 9 inches. Published by the American Foundrymen's Association, 222 W. Adams St., Chicago, Ill. Price to non-members, $5.

This comprehensive handbook on cast metals was first published in 1935, the object being to present to engineers, designers, and users of castings, as well as engineering students, condensed authoritative and up-to-date data on the properties and use of cast metals. The information presented is intended to enable the user to select the material best suited for his purpose.

The present edition has been revised and expanded to record the progress made in this field in the last five years. The main sections of the book cover: Recommendations to Designers of Castings; Recommendations to Buyers of Castings; the Significance of Strength and Ductility Tests of Metals; Cast Steel; Malleable Iron; Non-Ferrous Alloys; and Cast Iron. The present edition has been completely revised, and contains 30 per cent of new material, including chapters on the design of steel castings; effect of alloys on cast iron; specific uses of alloy cast irons; new non-ferrous castings; proper application of non-ferrous castings; and the significance of strength and ductility tests.

MACHINE SHOP WORK. By Frederick W. Turner and Oscar E. Perrigo; revised by Aldrick Bertrand. 412 pages, 5 1/2 by 8 1/2 inches. Published by the American Technical Society, Drexel Ave. at 58th St., Chicago, Ill. Price, $2.75.

This is a new edition of a book on machine shop methods originally published in 1916, covering the construction and use of tools and machines, details on their efficient operation, and a discussion of modern production methods. The book has been thoroughly revised and brought up to date. The contents cover hand-operated tools; power-driven tools; laying out work; gear-cutting; turret lathes; automatic screw machines; modern manufacturing methods; air tools; and the slide-rule.

MECHANICAL WORLD YEAR BOOK (1940). 360 pages, 4 by 6 inches. Published by Emmott & Co., Ltd., 31 King St. W., Manchester 3, England. Price, 1/6.

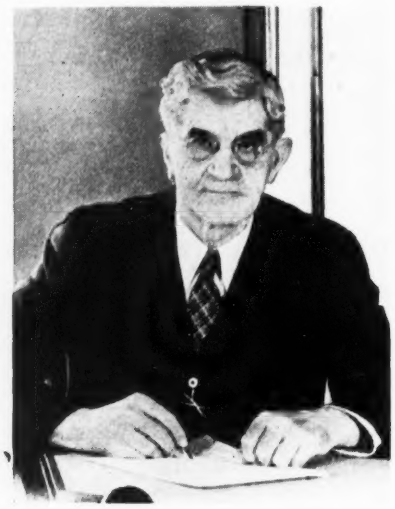
This is the fifty-third year of publication of this little handbook for mechanical engineers. The material in the present edition has been revised and some new material added, including an entirely new section on steam boilers. Attention has been given particularly to war-time needs in selecting matter for the new edition. A new separate index to the tabular matter has been compiled.

OBITUARIES

J. E. Frantz

J. E. Frantz, president of the Landis Tool Co., Waynesboro, Pa., died on December 16, after a long illness, at the age of seventy-two years.

In 1890, Mr. Frantz became associated with Landis Bros., of Waynesboro,



J. E. Frantz

Pa., shortly after they had begun the manufacture of the first Landis grinders. When the Landis Bros. plant was destroyed by fire in 1897, he was largely responsible for the formation of the present company, and became its first secretary and treasurer. In 1906, he became general manager, and in 1925, president of the company, an office which he held until his death. During his connection with the organization he saw it grow from a small group of six workers to a concern employing close to 1500 men and women. He became well and favorably known throughout the machinery industries, as he guided his company to one of the leading positions in its field.

In addition to his business interests, Mr. Frantz was always keenly interested in the affairs of his community. He was a member of the boards of numerous local organizations, including the First National Bank and Trust Co., Waynesboro Hospital, and others. He was also active in the Pennsylvania State Chamber of Commerce, of which he served as a director.

Mr. Frantz was a man who in spite of a very busy career always took time to greet anyone who wished to see him. He was never too occupied to discuss problems with his employes, his fellow citizens, or his friends. His long years of experience, added to his penetrating judgment, made his opinions much sought and respected. His passing will be felt not only by the organization with which he was so long identified, but also by the community in which he lived and by his many friends throughout the industry.

George E. Gustafson

George E. Gustafson, works manager of the Kearney & Trecker Corporation, Milwaukee, Wis., was killed on January 8 in an automobile accident near Mukwonago, Wis., at the age of thirty-nine. Mr. Gustafson was a native of Fitchburg, Mass., and served his apprenticeship with the Simonds Saw & Steel Co. of Fitchburg. Later he was associated with the Niles-Bement-Pond Co. as service man and with Manning, Maxwell & Moore as salesman.

His connection with the Kearney & Trecker Corporation covered a period of thirteen years, during which time he held the positions of salesman, sales engineer, advertising manager, and for the last three years works manager. He was responsible for many new manufacturing applications and kept abreast of all the improvements in machine tool design. He had many friends among his co-workers and throughout the industry. Mr. Gustafson was unmarried.

Edwin W. Allen, vice-president of the General Electric Co., Schenectady, N. Y., since 1926, died on January 1 in the Johns Hopkins Hospital, Baltimore, Md., where he had been undergoing treatment for two months following an operation. Mr. Allen was born at Millview, Va., in 1879, and graduated from the Virginia Polytechnic Institute in 1900. The following year, he entered the employ of the General Electric Co. as a student engineer. He was located in Schenectady until 1911, when he was appointed engineer of the central district, with headquarters in Chicago. In 1924, he was made manager of the engineering department and returned to Schenectady. Two years later he was elected a vice-president. Mr. Allen was a fellow of the American Institute of Electrical Engineers and a member of the Western Society of Engineers.

Francis Joseph Shiring, manager of factory service at the East Pittsburgh Works of the Westinghouse Electric & Mfg. Co., died on December 22 of a heart attack at his home. Mr. Shiring was sixty-two years old at the time of his death, and had been with the Westinghouse organization for forty-five years. He was born in Pittsburgh in 1877 and attended the elementary schools in Crafton and Turtle Creek, Pa. Following a business course, he was employed at the East Pittsburgh Westinghouse Works in 1894, with which organization he was associated from that time until his death.

COMING EVENTS

March 6-9 — Industrial Tools and Equipment Exhibition at the State Armory, 1494 Main St., Bridgeport, Conn., under the auspices of the Bridgeport Tool Engineers Association.

March 7-9 — Annual meeting of the American Society of Tool Engineers in New York City. For further information, communicate with Ford R. Lamb, executive secretary, 2567 W. Grand Blvd., Detroit, Mich.

March 14-15 — Aeronautic Meeting of the Society of Automotive Engineers at the Hotel Washington, Washington, D. C. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

April 9-10 — Midwest Power Conference at the Palmer House, Chicago, Ill., sponsored by the Armour Institute of Technology in cooperation with seven middle-western colleges and universities and various engineering societies.

May 6-10—Convention and exhibition of the American Foundrymen's Association to be held in Chicago, Ill., with exhibits at the International Amphitheater, and headquarters of the convention at the Palmer House. American Foundrymen's Association, 222 W. Adams St., Chicago, Ill.

May 20-22—Annual convention of the American Gear Manufacturers' Association at Grove Park Inn, Asheville, N. C. J. C. McQuiston, manager-secretary, 602 Shields Bldg., Wilkinsburg, Pa.

June 9-14 — Summer meeting of the Society of Automotive Engineers at the Greenbrier Hotel, White Sulphur Springs, W. Va. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

October 7-11—National Safety Congress and Exposition to be held at the Stevens Hotel, Chicago, Ill., under the auspices of the National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

October 8-12—Southern Power and Engineering Show in the Armory Auditorium, Charlotte, N. C. For further information, address Junius M. Smith, vice-president, Southern Power and Engineering Show, Inc., P. O. Box 1225, Charlotte, N. C.

October 21-25 — National Metal Exposition, to be held at Cleveland, Ohio, under the auspices of the American Society for Metals. W. H. Eisenman, secretary, 7301 Euclid Ave., Cleveland.